6th Annual **PRESS** *TOOLING and PRODUCTION* Feature Issue

- short run dies
- carbide dies
- body stampings
- press brake tooling
- die steel metallurgy
- forming stainless steels

The Magazine of

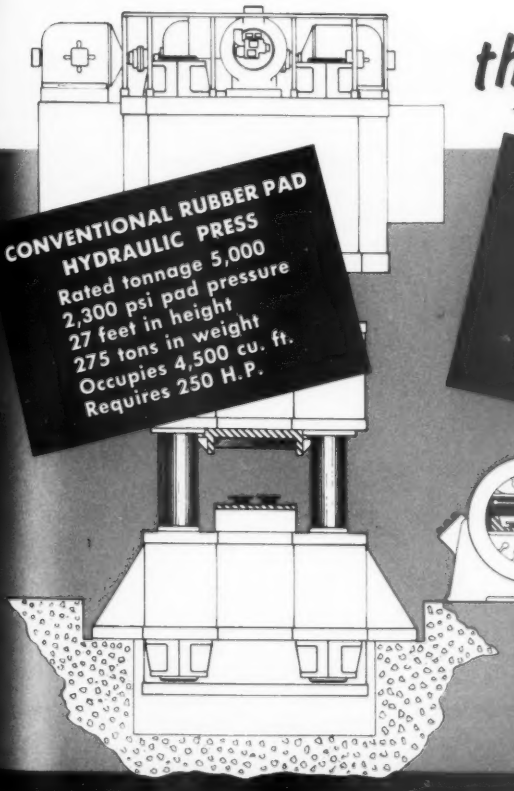
TOOLING and PRODUCTION

TOOL & DIE JOURNAL

JUNE, 1952

THESE TWO MACHINES (drawn to scale) **ARE FOR**

the same job...



CONVENTIONAL RUBBER PAD HYDRAULIC PRESS
Rated tonnage 5,000
2,300 psi pad pressure
27 feet in height
275 tons in weight
Occupies 4,500 cu. ft.
Requires 250 H.P.

THE NEW VERSON-WHEELON DIRECT ACTING HYDRAULIC PRESS
Rated tonnage 10,000
5,000 psi pad pressure
5' 4" in height
50 tons in weight
Occupies 675 cu. ft.
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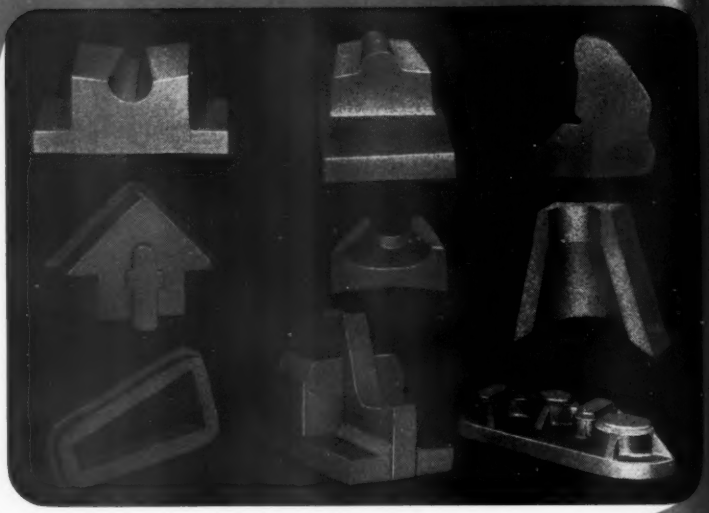

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FCC Cast-To-Shape, the modern method of tool and die making, is effecting important savings of time, trouble and money for an increasing number of manufacturers.

Even very intricate shapes can now be cast successfully within an eighth inch of finished size. This means that you buy less steel at the start and reduce machining costs substantially.

Tools which could not be made by conventional methods except in sections can often be fabricated from FCC Cast-To-Shape blanks in a single piece.

In many instances performance of the tool is better than can be obtained by fabrication from bar stock or forgings.

Particulars are available through our field representatives; or write direct to *Allegheny Ludlum Steel Corporation, Forging and Casting Division, Wanda and Jarvis Avenues, Detroit 20, Michigan.*

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Gives you full details on FCC Air Hardening, Oil Hardening and other Cast-To-Shape Tool Steel Specialties capable of saving you time and money.

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For complete MODERN Tooling, call

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FINE TOOL STEELS SINCE 1854

HERE ARE THE END MILLS you can count on for fast, free cutting and extra long life — a bonus provided by complete uniformity and assured by Putnam's rigid quality control. For more work for your money, specify Putnam High Speed End Mills. Over 1000 standard sizes and types available.

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TOOL COMPANY
2985 CHARLEVOIX AVENUE · DETROIT 7, MICHIGAN

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The Magazine of

TOOLING and PRODUCTION

TOOL & DIE JOURNAL

1975 Lee Road ● CLEVELAND 18, OHIO

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Member of CCA

TOOLING and PRODUCTION is published monthly for plant operating and purchasing executives and department heads in 50 types of end product and contract manufacturing companies.

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These men, from whom emanate recommendations, requisitions and orders for needed materials, tools, equipment and accessories, comprise the Cycles of Buying Influence within their respective plants—CBI—and it is they who constitute TOOLING and PRODUCTION'S ever-vital reader circulation.

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CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 32, MICHIGAN

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CINCINNATI Shears at CONVAIR

Photo Courtesy Consolidated Vultee Aircraft Corp., Fort Worth, Texas

This 3/16" x 18' Cincinnati All-Steel Shear, one of the Cincinnati units at Convair, has the length to cut full length standard sized sheets.

Cincinnati All-Steel Shears at Consolidated Vultee Corporation are shearing sheets straight and true in the important production of the world's largest bombers.

Illustration shows a 3/16" by 18' Cincinnati Shear, one of the Cincinnati units at Convair. Aircraft production requires unusual length as well as unusual accuracy in shearing. Cincinnati furnishes shears to the aircraft industry in lengths up to and including 24' of length in 1/4" thickness.

Cincinnati All-Steel Shears will give you accurate performance. Write for Shear Catalog S-6.

THE CINCINNATI SHAPER CO.

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BALAS also makes:

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- Special Collets
- Master Collets
- Squirrel Cage Pushers
- Master Pushers
- Feed Fingers

You can actually add hundreds of productive hours by using Balas Master Collets, either Martin or "CB" type, since they permit rapid change over from one stock size or shape to another, merely by changing the pads without disturbing the setting of the collet.

Balas special cam-grinding on the taper to a "cloverleaf" shape prevents "sticking" in the chuck, permits faster opening and closing, allows tighter gripping and reduces chatter. Precision manufacturing processes, special heat treating and rigid inspection insure the utmost accuracy and longer life.

More and more concerns are experiencing unprecedented results with collets made by Balas. You, too, can profit from Balas Collet engineering...and the right time to start saving time with Balas Collets is now!

BALAS COLLET MANUFACTURING CO.

1563 EAST 27th STREET CLEVELAND 14, OHIO

WORLD'S LARGEST MANUFACTURER OF COLLETS EXCLUSIVELY

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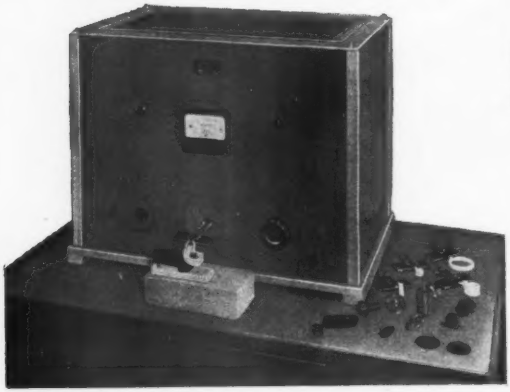
A Low Cost PORTABLE

HIGH FREQUENCY

Induction

HEATING UNIT



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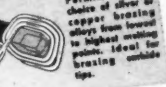
Permits widest choice of silver or copper brazing alloys from lowest to highest melting points. Ideal for brazing carbide tips.



HARDENING

Heat localized exactly where wanted at desired temperature. Ideal for gears, cams, bearing surfaces, cutting tools and other areas that are subject to wear.

SOLDERING

Speedily and neatly performs intricate soldering applications with or without the use of pre-formed rings.

ANNEALING

Ideal for annealing, stress-relieving, normalizing or pre-heating selected areas.

MELTING

Readily melts quantities of ferrous and non-ferrous metals in either graphite or ceramic crucibles.

- **SMALL AND COMPACT** Conveniently operated on bench or table—no mounting necessary.
- **ECONOMICAL OPERATION** No special power installation required. Operates on 110 volts, 60 or 50 cycle line at unity power factor.
- **FULLY GUARANTEED** Guaranteed for continuous duty cycle and stated performance.

This versatile unit is priced so low that every shop may now take advantage of modern induction heating techniques to improve quality and to increase production. Its simplicity of operation eliminates the need for skilled personnel.

The Lepel Model 2 KW will meet the requirements of machine shops, toolrooms, research laboratories and educational institutions. It is especially suitable for hardening, brazing and soldering small parts of either ferrous or non-ferrous metals.

Complete unit with line connection and load coil.

$870.

f.o.b. factory

WILL HEAT TO 1500° F.

1/8"	steel rod 1" length in approx.	1 second
1/4"	" " " " "	3 seconds
1/2"	" " " " "	15 seconds
1"	" " " " "	60 seconds

Will melt 4 ounces of brass or steel in 4 minutes.
Equally well suited for heating of non-ferrous metals.

LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

WRITE FOR LEPEL CATALOG TD-6

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KANSAS CITY, MO. VI 3558
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MINNEAPOLIS PR 1822
MONTREAL, CAN. WI 1186
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ST. LOUIS FR 6811
ST. PAUL CE 1600
TOLEDO MA 4510
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2895 W. GRAND BLVD. • DETROIT 2, MICHIGAN
DETROIT DIE SET ★

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CALL Sid Tool COMPANY "HARD TO FIND TOOLS FOR STOCK DELIVERY"

Why Wait for SPECIAL TAPS?

we have them in STOCK for IMMEDIATE DELIVERY

HIGH SPEED [SPECIAL] RIGHT HAND TAPS

SIZE	THREAD
4	32-40-60-64
5	30-32-36-40-80
6	30-40-48-56-60
7	32-48
8	24-30-36-38-40-44-48
9	24-28-32-40
10	28-30-36-40-48-64
12	28-28-32-36
14	20-24-28
1/16	60-64
5/64	72
3/32	48
7/64	48-56
1/8	32-40
5/32	32-36-40
9/64	36-40
11/64	36
3/16	20-24-32
13/64	32
7/32	24-28-32
1/4	16-24-26-27-30-32-36-40
5/16	16-20-22-27-28-32-40

SIZE	THREAD
3/8	12-16-18-20-27-28-32-36-40-48
7/16	12-16-18-22-24-27-28-30-32-36-40
1/2	12-14-16-18-22-24-26-27-28-30-32-40
9/16	16-20-24-27-28-30-32-40-48
5/8	12-14-16-20-24-27-28-32-36-40
11/16	11-16-18-20-24-27-28-30-32
3/4	9-11-12-14-16-20-24-26-27-28-32
13/16	16-14-18-20-32
7/8	10-12-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-32
1	10-12-16-18-20-24-27-32-40
1-1/16	12-14-16-18-20-24
1-1/8	8-10-14-16-18-20-24-32
1-3/16	8-10-12-14-16-18-20-24
1-1/4	8-10-14-16-18-20-24-32
1-5/16	12-14-16-18-20-24-32
1-3/8	8-10-14-16-18-20-24
1-7/16	8-10-12-16-18-20-24
1-1/2	8-10-14-16-18-20-24-28
1-9/16	16-20-24
1-5/8	5-1/2-8-10-12-13-16-18-20-24
1-11/16	10-12-14-16-18-20-24

SIZE	THREAD
1-3/4	8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20-24
1-15/16	8-10-12-14-16-18-20-24-28
2	4-1/2 - 8-10-12-16-18-20
2-1/16	12-14
2-1/8	12-16-20
2-3/16	12-16
2-1/4	4-1/2 - 8-12-14-16-18
2-5/16	12-18
2-3/8	12-16-18
2-1/2	8-16-12
2-9/16	16
2-5/8	12-16-20
2-3/4	16
2-7/8	8-12-16
3	8-16
3-1/4	8-12-16
3-1/2	8-12-16
3-7/8	6
4	8-12

HIGH SPEED LEFT HAND TAPS

SIZE	THREAD
0	80
1	56-64-72
2	56-64
3	56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-30-32-40
12	24-28-32
1/4	20-28-32
5/16	18-20-24-28-32

SIZE	THREAD
3/8	16-24-32
7/16	14-20-28
1/2	12-13-20-28
9/16	12-18-20-24
5/8	11-12-18-20-24
11/16	11-16-24
3/4	10-16-18-20
13/16	16
7/8	9-12-14-18-20
1	8-12-14-16-18-20
1-1/8	7-12
1-1/4	7-12-16-18

SIZE	THREAD
1-3/8	6-8-10-12-16-18-20-24
1-7/16	8-10-12-14-16-18-20
1-1/2	6-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	8-10-12-14-16-18-20
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1-3/4	8-10-12-14-16-18-20
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20
1-15/16	8-10-12-14-16-18-20
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- *SPECIAL AND LEFT HAND DIES IN STOCK*

Prices on Application. We are always adding new sizes

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50% to 300%

Handles Stock up to 3/16" Thick

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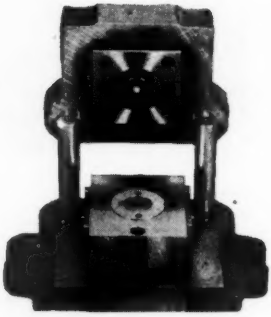
A MUST wherever WASHERS are made!

HOVIS

OFFERS YOU THIS SIMPLE, UP-TO-THE-MINUTE METHOD

There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.



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¾"—1½"—2½"—4"—6".

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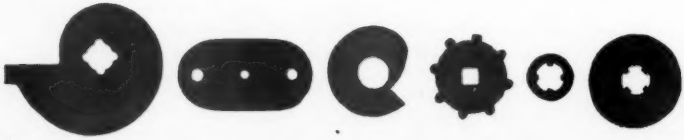

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You know — it's really surprising how many difficult milling operations can easily be handled by Kempsmith Standard Attachments mounted on a standard milling machine.

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Look to Kempsmith for milling machines, attachments, arbors and accessories. They are backed by more than 60 years specialized experience in this field.

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KEMPSMITH MACHINE CO., 1829 S. 71st St., Milwaukee 14, Wis., U. S. A.

KEMPSMITH

Precision Built Milling Machines Since 1888

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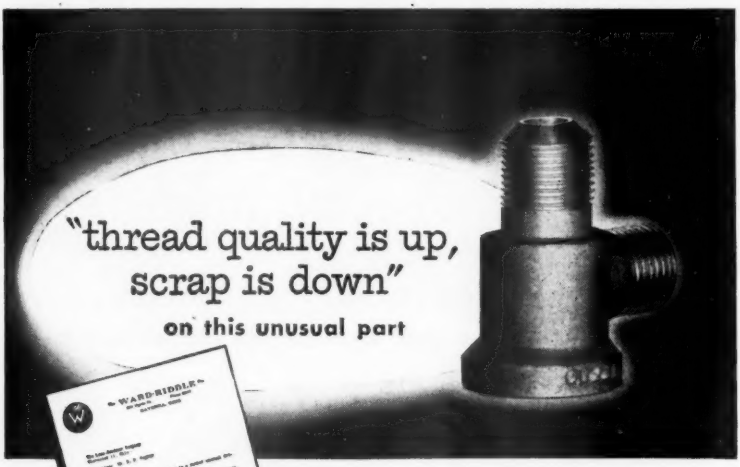
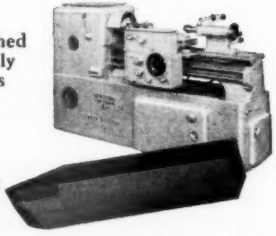


Mr. Hugh W. Riddle of the Ward-Riddle Co. wrote our headline when he described the versatility and speed of the Cri-Dan, using a single point carbide tool.

His production problem involved an aluminum casting for a flow control valve body.

With his Cri-Dans, the job, (virtually impossible on a turret lathe) is accomplished in a total of 56 seconds per piece with only ½ of 1% scrap. This effects a tremendous savings in time, material and tool costs in addition to increasing production on the turret lathes.

If you have a threading operation—whether "run of the mill" or something unique, you can get the same speed and efficiency by contacting your Lees-Bradner representative now.



CRI-DAN B Single Carbide Tool, High Speed Threading Machine

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

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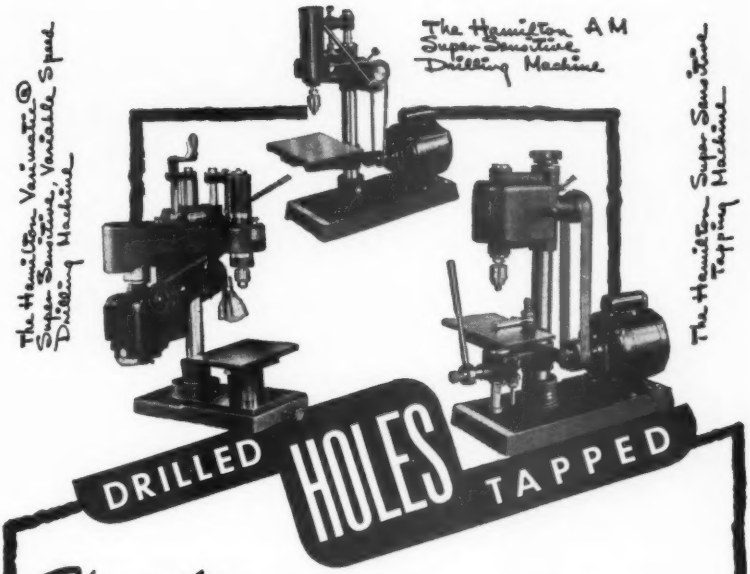
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The Hamilton A-M Super-Sensitive Drilling Machine
The Hamilton Super-Sensitive Tapping Machine

DRILLED HOLES TAPPED

Hamilton DRILLS AND TAPPERS

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ON ACCURATE SMALL HOLE PRODUCTION

Small holes . . . *tiny holes* . . . in materials of such diverse characteristics as fiber and monel, ceramic and bronze, are being drilled and threaded speedily, accurately, *profitably* . . . NOW . . . by thousands of Hamilton Drills and Tappers.

The Hamilton VARIMATIC® DRILL,
The Hamilton A-M DRILL,
The Hamilton TAPPER,

each a bench type, super-sensitive machine with ample clearances and travel, incorporate such precision that work is always held well within the tolerance allowed, and such stamina that they maintain their accuracy year after year even under heavy production loads. Our free Bulletin No. V-472 provides full information including specifications. Write now! Tomorrow you may need the information.

THE *Hamilton* TOOL COMPANY
832 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

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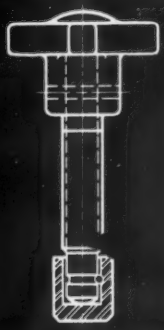
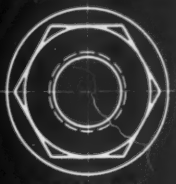
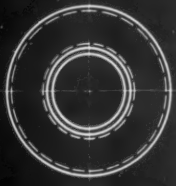
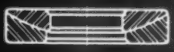


KNOB SHOE ASSEMBLY



FLANGE NUTS





SPHERICAL WASHERS

STANDARDIZE

with

WESPO

STANDARD FIXTURE PARTS and FITTINGS

★ ★ ★

The cut shows a few of the 350 parts and fittings which are used by leading manufacturers to save time and money formerly spent in designing and machining.

WESPO parts are precision manufactured of quality steel—heat treated and rust proofed. They are made for heavy duty and long usage and have proved their value in many industries.

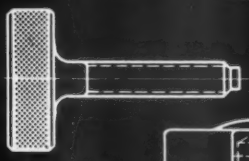
OVER 350 PARTS AVAILABLE

This wide variety of types and sizes makes it easy to use WESPO parts for almost any of your fixture needs. TEMPLATE DRAWINGS OF ALL PARTS ON REQUEST. Write for catalog.

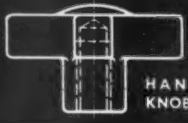
WEST POINT MFG. CO.

26935 West 7 Mile Road

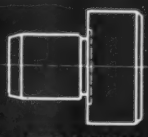
Detroit 19, Michigan



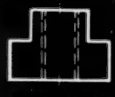
ADJUSTING HEAD SCREWS



HAND KNOBS



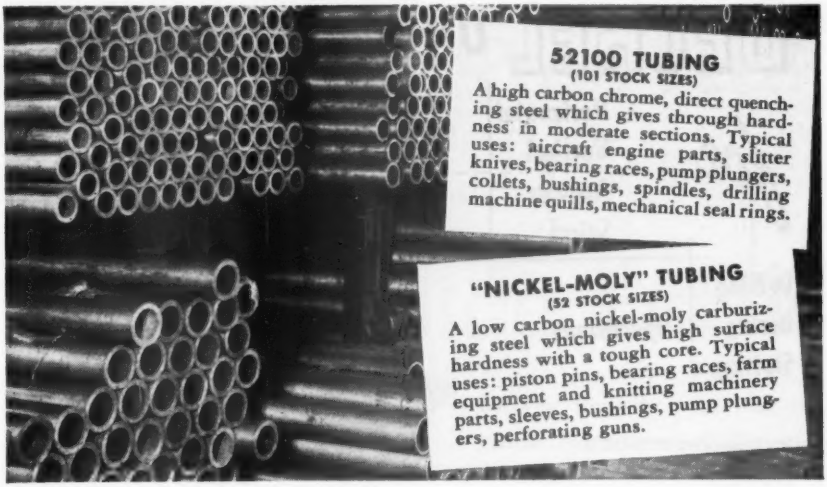
REST BUTTONS



T-SLOT NUTS

TEMPLATE DRAWINGS OF ALL PARTS FREE

DELIVERY NOW FROM MILL STOCK!


52100 TUBING
(101 STOCK SIZES)
A high carbon chrome, direct quenching steel which gives through hardness in moderate sections. Typical uses: aircraft engine parts, slitter knives, bearing races, pump plungers, collets, bushings, spindles, drilling machine quills, mechanical seal rings.
"NICKEL-MOLY" TUBING
(52 STOCK SIZES)
A low carbon nickel-moly carburizing steel which gives high surface hardness with a tough core. Typical uses: piston pins, bearing races, farm equipment and knitting machinery parts, sleeves, bushings, pump plungers, perforating guns.

These two TIMKEN® wear-resistant steels will do 90% of your hollow parts jobs!

NEED steel tubing in a hurry? Within 24 hours we'll ship you warehouse quantities of two Timken® steels that will do 90% of your hollow parts jobs: Timken 52100 steel and Timken "Nickel-Moly" steel.

Ask for 52100 if you need a steel that can be heat treated to file hardness and tempered back to any desired point. It's a high carbon steel that has through hardenability in moderate sections. It has high wear resistance and often can be used in place of more expensive steels. Available in 101 sizes from 1″ to 10½″ O.D.

Ask for "Nickel-Moly" if you need high case hardness and a tough core. It's a fine-grained carburizing steel with exceptional stamina and shock absorbing qualities when heat treated. Available in 52 sizes from 1⅜″ to 10¼″ O.D.

With both of these Timken steels you're sure of uniformity from tube to tube and order to order because every step from melt shop to final tube inspection is controlled in the Timken Company's own mills. For the current mill stock list, write The Timken Roller Bearing Co., Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN
TRADE-MARK REG. U.S. PAT. OFF.
Fine Alloy
STEEL

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

DECKEL UNIVERSAL MILLERS

for Horizontal / Vertical / Angular / Spiral — Milling

Drilling / Boring / Slotting — Operations

The Deckel FP 1 UNIVERSAL MILLER, with its various attachments, work holders and indexing fixtures, makes it easy and economical to produce many types of work pieces on a single job or mass production basis. Work pieces can be machined in one set-up and without the use of elaborate tools, jigs or fixtures.

Basic features of the FP 1 include heavy column, adjustable guide ways and spindles, large graduated scales, high precision measuring equipment, convenient location of operating controls, directional single lever control of automatic table feeds and ample power for removing metal at a high rate.

Model FP 1
Universal Miller

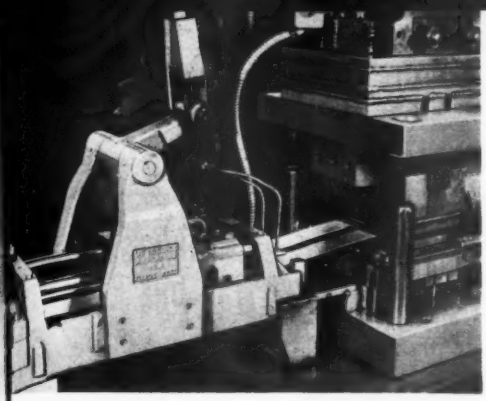
SEE THESE MACHINES IN OPERATION AT COSA'S NEW YORK SHOW ROOM OR SEND FOR DESCRIPTIVE LITERATURE

Other Deckel Machines for Tooling and Production
2 DIMENSIONAL ENGRAVERS
3 DIMENSIONAL ENGRAVERS
UNIVERSAL PANTOGRAPH DIE SINKERS
UNIVERSAL TOOL & CUTTER GRINDERS

COSA CORPORATION
405 Lexington Ave., New York 17

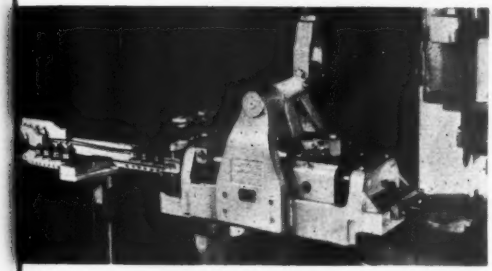
Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.



The Answer to Your Press Feed Problems

U. S. Slide Feeds



Do you want to feed thin material? Thick material? Flat wire? Round wire? Irregular cross-sections? Two strips at a time? Whatever the job, there's a U. S. Slide Feed that can do it.

For descriptions of U. S. Slide Feeds, U. S. Roll Feeds, U. S. Straighteners, U. S. Stock Reels and U. S. Coil Cradles ask for a copy of Bulletin No. 70-T.

In addition to their main feature — Controlled Accuracy — U. S. Slide Feeds are highly versatile, and can be used for feeding such materials as:

1. **Flat stock (steel, brass, copper, aluminum, etc.)**
2. **Flat stock (paper, fibre, wire cloth, etc.)**
3. **Stock with tapered or irregular cross-section.**
4. **Round, square or hexagon-shaped wire.**

Although primarily designed for feeding stock which comes in coils, the U. S. Slide Feed can be arranged for butt-feeding stock which comes in short lengths, when the thickness is over .030" and the material is of sufficient stiffness.

U. S. Slide Feeds can be used to feed more than one strip at the same time. In both of the setups shown the stock is being fed two strips at a time, thus greatly increasing production output.

U. S. Slide Feeds can pull stock through a plain straightener and maintain controlled accuracy.

US PRODUCTS

U. S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides—U. S. Multi-Millers

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

SIX SPINDLE
PRE-SELECTIVE SPINDLE SPEEDS
TURRET TYPE AUTOMATIC INDEXING
DRILLING AND TAPPING MACHINE

. . gives you 6 MACHINES IN ONE

THE NEW No. 2 MODEL A

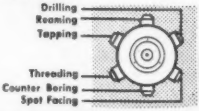
Burgmaster

Designed for . . .
HIGHER PRODUCTION WITH GREATER ACCURACY AT LOWER COST PER PIECE MACHINED

The No. 2 Model A BURGMASTER will definitely cut your second operation costs because: Loss of time due to movements of parts from one spindle to another are eliminated; Close tolerances on size and concentricity are easily maintained; Set-up is simple and fast—unskilled operators can run the machine; Less floor space and power required; Rigidity, power and spindle speeds permit the use of high cutting speeds.

Now equipped with Warner Electric Clutch units in speed change mechanism.

★ ¾" Drill Capacity
★ ½" Tap Capacity
★ 1 to 2 H.P., 2 speed, 3 phase, 60 cycle Motor
★ 12 Spindle Speeds, ranging from 225-3000 R.P.M
★ 4 Speeds, pre-selective per spindle, at any one setting
★ 8" Ram Feed
★ 19" Table Travel
★ Throat Depth—11-5/16"
★ Spindles Mounted on Class "O" Timken Bearings
★ Power Index, utilizing Geneva Mechanism
★ Individual Depth Stops
★ Completely Enclosed Gear Box
★ Table work surface—17"x33"
★ Approximate weight—1650 lbs.
★ Floor space required—36"x48"
★ Extremely close tolerance can be held



Write today for detailed information.

BURG TOOL MANUFACTURING CO. Dept. T3
3743 DURANGO AVENUE • LOS ANGELES 34, CALIFORNIA

ONE of AMERICA'S PRINCIPAL PRODUCERS of DRILL JIG BUSHINGS

ANNOUNCES ABC Precision Quality Piercing Punches

of premium steel, in two basic types:

Water Hardening Tool Steel — and High Speed Steel

The high quality performance of a punch depends upon:

(a) The Correct Quality Steel

(b) Precision Heat Treatment to gain full advantage of its properties

(c) Qualified Workmanship to insure dimensional accuracy

To these basic requirements must be added modern equipment to make possible production at reasonable prices. We have taken every possible step to produce an outstanding punch.

The water hardening tool steel we have selected is guaranteed to definite standards of grain size and depth of hardenability. For "shock absorber" action, the head and upper part of the shank are drawn back to 45-50 Rockwell C in such manner as to have a hardness gradient, rather than a sharp line of demarcation between different sections.

The underside of the head is ground slightly at the same time as the shank. This insures squareness of the underside of the head with the shank, and minimizes breakage during stripping.

RELATED CONCENTRICITY — As a further example of the "built-in" qualities of A • B • C Precision Punches: the point is ground concentric with the body, insuring excellent concentricity between point and shank.

To achieve these A • B • C advantages, plus fine finish and smoothly blended radius to minimize stresses, we developed within our own organization special grinding fixtures and dressing equipment not found in outside markets. And, back of all this is our long record as one of the country's principal producers of premium quality drill jig bushings and fine precision parts for the automotive and other industries.

ACCURATE BUSHING COMPANY

Main Office and Factory • 433 North Avenue, Garwood, New Jersey • WEstfield 2-6400

Also Engineering Offices and Regional Warehouse • 5722 W. Chicago Ave., Chicago 51, Ill. • ESterbrook 8-7100

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SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

Nichols
TOOL ROOM MILLER

Accurate
Sensitive
Versatile

A compact, rugged miller that gives the tool room what it demands—extreme accuracy and utmost flexibility. The NICHOLS TOOL ROOM MILLER is arranged for sensitive hand screw feed. It has generous table surface of 8½" x 30", with 19" longitudinal travel. Precision feed screws are fitted with oversize, easy-reading micrometer dials. Large hand wheels provide the element of "feel" so important in precision milling. Rise-and-fall spindle enables easy handling of many difficult operations—increases usefulness—simplifies set-ups. Readily available are dividing head, vertical attachments, vises, and a full line of milling accessories. Priced surprisingly low. Literature on request.

MANUFACTURED BY W. H. NICHOLS COMPANY, WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS

ni NICHOLS-MORRIS CORPORATION

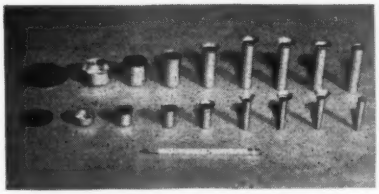
76-X Mamaroneck Avenue, White Plains, New York

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

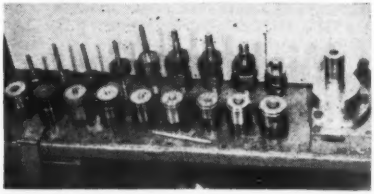
AT ADVANCE STAMPING COMPANY–

Output per press jumps 34½% with Carboloy dies

On typical drawing job, Carboloy dies average 100,000 pieces in 52 hours . . . other dies require 70 hours to do the work.



HERE ARE 2 typical 18% nickel silver stampings made at the Advance Stamping Company plant. The larger (top row), an electrical control part, is made from .025" strip. The smaller (bottom row) is drawn from .007" strip. On parts such as these, Carboloy dies may draw up to 500,000 parts without being repolished.



THIS IS a set of dies for deep drawing. Die set at the right is a blanking die; the others are draw dies and a pinch-trim die. Carboloy die nibs, purchased with ground O.D., are press-fitted into hardened tool steel for the dies. Except for boring tools, wheels and lapping compound, no special equipment is required to finish the inside diameters to size.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

Specify CARBOLOY CEMENTED CARBIDE
The Quality Brand

The practice at Advance Stamping Company is to specify Carboloy dies for all deep drawing jobs of 100,000 pieces or more. It really pays off!

On this specific drawing job, the extreme wear resistance of Carboloy Cemented Carbide dies saves 18 hours of maintenance time per 100,000 pieces. This, of course, has the effect of boosting output per press 34½ percent . . greatly increasing *plant efficiency and capacity.*

Here are *plant-wide* results reported by Advance Stamping Company:

FEWER SHUTDOWNS: Carboloy dies give them a *minimum* of 5 to 6 times as many completed parts between resharpenings as tool steel dies will.

INCREASED EARNINGS: By standardizing on Carboloy dies they have been able to raise plant efficiency—and increase plant earnings.

DIE SAVINGS: Often the life of Carboloy dies is so long that dies are still in good condition after part becomes obsolete. (So they resize the dies and put them back to work on some other job.)

Other benefits reported by Advance Stamping include better product finishes and fewer rejects. Benefits that you, too, can get with very little effort.

Why not get the full story on long-wearing Carboloy dies? Call your local Carboloy representative, or write us direct for our free die engineering manual.

"Carboloy" is the trade-mark for the products of Carboloy Department of General Electric Co.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
[illegible] E. 8 Mile Ave., Detroit 34, Michigan

Gentlemen:
Send me, free, your helpful Die Engineering Manual D-124. I want the full story on Carboloy carbide dies.

Name _____ Position _____

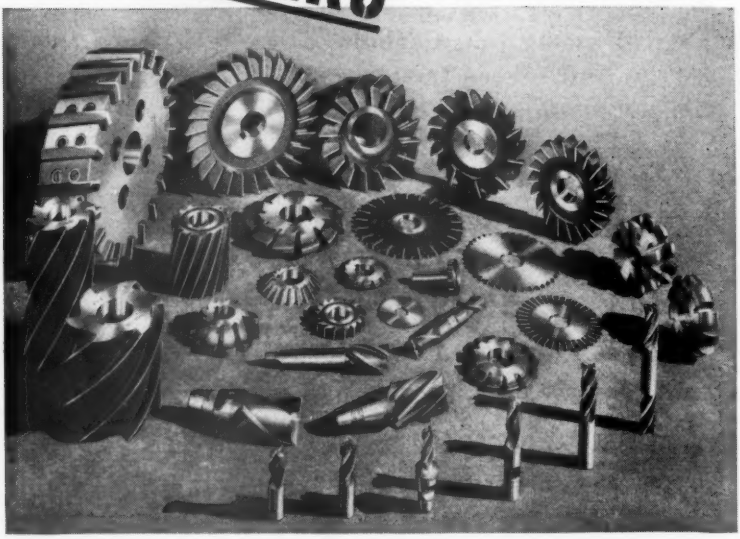
Company _____

Address _____

City _____ Zone _____ State _____

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

CUTTERS



for Top Production at Minimum Cost

YOU CAN COUNT on high productivity from your millers when you specify Brown & Sharpe Cutters. Top production is assured by careful, controlled cutter manufacturing and strict adherence to design specifications.

Brown & Sharpe Cutters cut more freely, consume less power, and stay sharp longer. They are available in the broadest selection of types and sizes — write for Catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

WE URGE BUYING THROUGH THE DISTRIBUTOR

Brown & Sharpe B·S

PLEASE US INFORM-A-GRAM FOR PRODUCT INFORMATION

BARREL FINISHING NEWS

TESTS PROVE "SUPER HONITE" GIVES TOP CUTTING SPEED

ST. PAUL, MINN.—Industrial research groups across the country recently completed a series of comparative tests on the cutting speeds and lasting qualities of all barrel finishing chips now on the market.

Results of these tests have just been announced by Minnesota Mining & Manufacturing Company—a leading abrasives manufacturer.

Punishing tests proved no other chip on the market cuts faster than "Super Honite."

This improved stone is formed by fusing grains of the world's toughest abrasive mineral—aluminum-oxide—with a ceramic, non-crystalline bonding agent that will not fracture or crumble.

LASTS TWICE AS LONG

The combination of a super-tough abrasive and a super-tough bonding agent gives "Super Honite" a 100% longer cutting life than other stones. In fact, *no other barrel finishing abrasive* lasts as long.

NEVER STOPS CUTTING

"Super Honite" never wears smooth. New cutting edges are constantly exposed as the surface area is slowly reduced.

Since the composition of each chip is the same throughout, used stones can be re-graded and used again on different operations, too.

See for yourself! Order a trial supply today. Write 3M, Dept. TP, St. Paul 6, Minn., for information and prices.

Barrel Finishing Experts offer you FREE services!

FREE BOOK

ST. PAUL, MINN. — Experienced 3M Engineers are now ready to work with you for increased barrel finishing efficiency, and a system that's tailored to your *particular* job.

Use the coupon below for immediate attention, and a copy of "3M Barrel Finishing." There's no charge or obligation.

Made in U.S.A. by Minnesota Mining & Mfg. Co., St. Paul 6, Minn.—also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 270 Park Avenue, New York 17, N. Y. In Canada: London, Ont., Can.

Honite

Minnesota Mining & Mfg. Co.
Dept. TP62, Saint Paul 6, Minnesota

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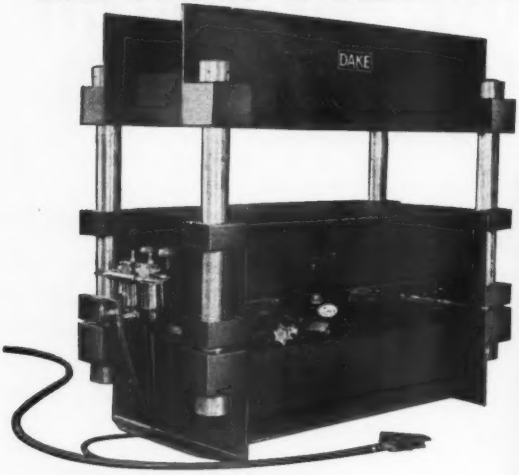
SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

MATCH DIES *in the toolroom*



DAKE Die Try-Out Press saves tying up production equipment

The photograph above shows a specially engineered, custom-built DAKE Die Try-Out Press of 125-ton capacity. Its guided platens assure uniform alignment in testing, enabling diemakers to match dies perfectly before they leave the toolroom.

This press was designed with an air-operated hydraulic cylinder and single-acting piston in the base. At the end of the upward stroke the release valve is opened, permitting the platen to descend by gravity.

The drawing illustrates another DAKE Die Try-Out Press—a 50-ton model with hydraulic workhead above the upper platen. The ram is powered on both up and down strokes.

Either of these presses may also be used for sample or short-run production. If you have a problem which requires development of a special press, it will pay you to communicate with DAKE.

Dake Engine Company, 634 Seventh St., Grand Haven, Mich.

DAKE arbor and hydraulic PRESSES

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

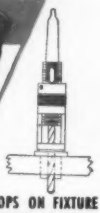
NEW DRILL STOP

...a positive control for depth of hole

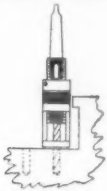
by S-J SCULLY JONES

End Guesswork and Reduce Rejects:
You often require close control of depth for operations — as in center drilling, drilling and reaming — on turret lathes, radial drills and other machines. On these operations, or wherever a quick change arrangement is used in one station for sequence operations, you hold uniform hole depth by using the new S-J Drill Stops. They provide a positive stop which ends guesswork and reduces rejects.

Quick and Easy to Insert, Remove and Adjust Tools:
Simply loosen set screw and slip stop collar from threaded shank for quick insertion or removal of taper shank tools. The threaded lock bushing provides quick and accurate adjustment of the stop collar. Only a quarter turn of the set screw forces the bushing against the shank threads for a positive lock.



STOPS ON FIXTURE BUSHING OR WORK



Work on Close Centers:
The small body diameter permits you to operate these Drill Stops on close centers and near shoulders or other obstructions.

Trouble-Free Performance:
S-J Drill Stops are made from an alloy steel with all points of wear hardened for long life. The four chip grooves tend to break up and remove any chips from the surface on which it stops. Investigate the use of S-J Drill Stops wherever you require a positive control for depth of hole. Made in 8 sizes having Morse Taper shanks and holes.

Write for BULLETIN NO. 18-50 for data on Drill Stops.

Scully-Jones AND COMPANY

1913 S. Rockwell St., Chicago 8, Ill.

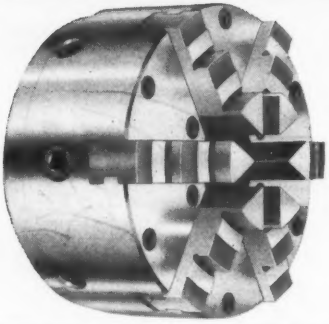
R-5728MT

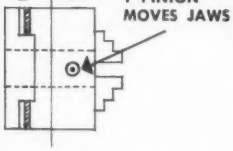
YOU GET LOW COST FAST ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

Buck AJUST-TRU CHUCKS

The UNIVERSAL Chuck with .0005 PRECISION!





HOW and WHY it works

Chuck gripping section "A" is like any scroll chuck with one pinion to move jaws. (accurate to .003"). Section "B" shows how chuck "floats" on adapter (.020" clearance) where 4 opposed screws move chuck on adapter for adjustment to dead true precision. Jaws always come back within .0005" on duplicate work.

6 Jaw 6" Chuck Handles Work of 93 Collets!

The capacity of $1,000 worth of collets for your tool room PLUS scroll chuck rechucking speed on duplicate parts with .0005" precision...

The firm grip of 6 jaws for soft metal or tube work...

An end to most needs for stub arbors, mandrels, or special fixtures...

A reliable precision chuck adaptable to lathes, screw machines, grinders, dividing heads...

The greatest development of recent years to save machinists' time...

That's the brief story of this sensational Adjust-Tru chuck. It is unbelievable — but true! Send for catalog with full details.

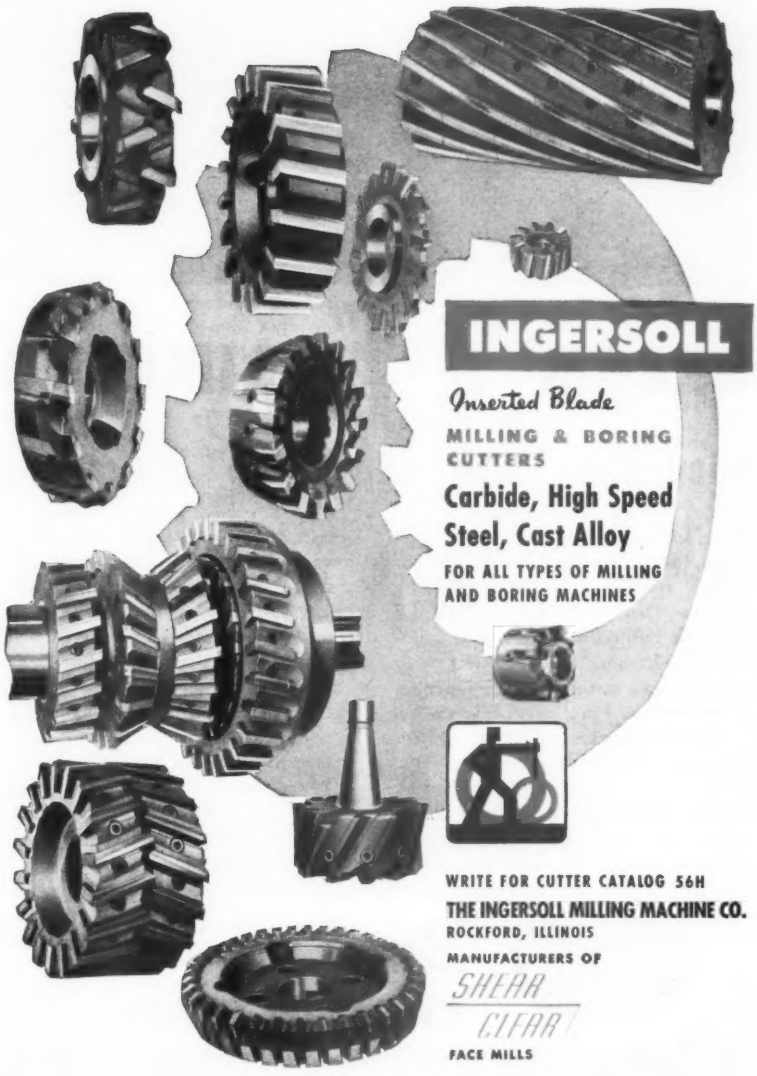
SIZES AVAILABLE:

3- and 6-Jaw Chuck — 4" (light duty); 5", 6", 7½" (heavy duty)

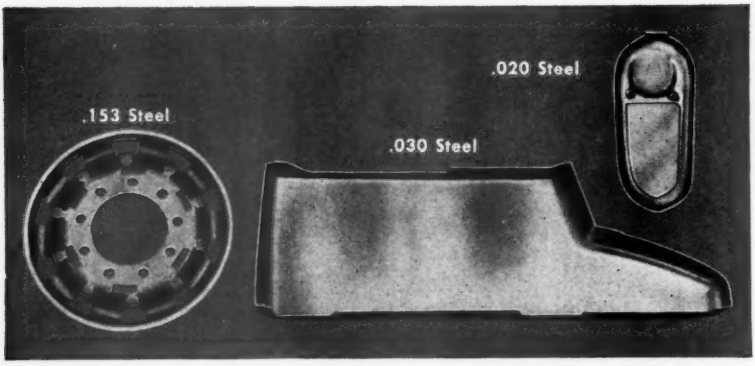
2-Jaw Aviation Chuck — 6", 7½" (heavy duty)

BUCK TOOL CO.

618 Schippers Lane • Kalamazoo, Mich.



SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS



BREHM "4-1" TRIMMING

Eliminates "Horn" and "Pinch" Operations

Slow, costly, multiple "horn" operations, and distorted edges due to "pinch" trimming can be eliminated by a Brehm Die. Operating on principles different than ordinary trimming methods, the Brehm "Shimmy" Die with angular cams causes the shearing edges to cut *four ways* in a *single* press stroke.

Materials, thickness, shapes and sizes look alike to a Brehm "Shimmy" Die. Whether it's stainless or mild steel, copper, brass, zinc, gold, fiber, silver, aluminum, rubber or plastic, Brehm users are assured of precise production results. Shapes can vary widely, whether a watch case, artillery case, refrigerator door, automotive or aircraft part. Clean, flat, burr free edges are assured. Edge contours can be straight or curved, with multiple notches and projections.

When model changes alter the part design, or if you wish to handle an entirely new part, you only need to substitute cutting adapters.

Write today . . . for a free catalog. Find out what a Brehm "Shimmy" Die can do—submit blueprints, or the part for full information or quotation.

THE "SHIMMY" REG. DIE ®

Brehm

TRIMMING DIES

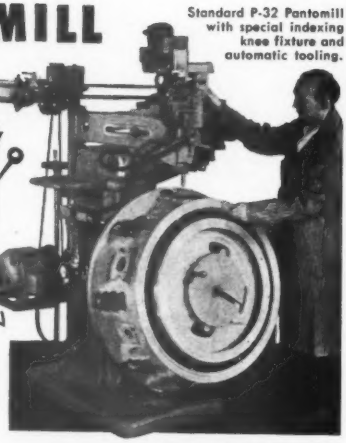
THE STEEL PRODUCTS ENGINEERING CO.

BREHM DIE DIV., DEPT. H, SPRINGFIELD, OHIO

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

GORTON PANTOMILL

Solves Complex Profiling Problems with Automatic Cutting Cycle

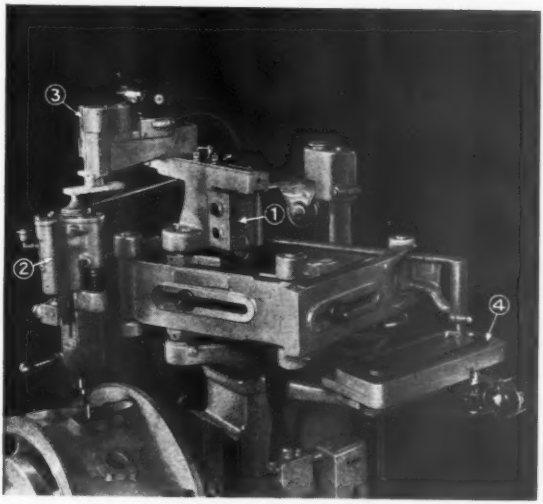


Standard P-32 Pantomill with special indexing knee fixture and automatic tooling.

PROBLEM: Profiling eight ports in outside portion of aircraft part, a large aluminum-alloy casting. The sides of each port are parallel; one end has a true radius, the other end is parabolic.

SOLUTION: Gorton P-32 Pantomill profiles all eight ports at the rate of 2.3 minutes per port. Cutting cycle is automatic; indexing is manual.

This is truly a power-driven tracer-control job that would require hours if done by a combination of other methods.



Here's How It Works

1. Complete cutting cycle begins when "start" button is pressed.

2. Air cylinder automatically feeds cutter down to cutting position. Cam-operated spindle down feed then takes over. Upon completion of cut and after spindle retracts, this air cylinder further retracts cutter for clearance.

3. Speed of spindle down feed during cutting is controlled by cam through a Variac.

4. Motorized chain-driven master starts automatically when "start" button is pressed.

This is just one of many Gorton tracer-controlled production short-cuts which might save you time and money. For complete information, clip and mail the coupon now.

Please send at once complete information about the Gorton line contained in Bulletin 1655-1206.

Firm .....
Name .....
Title .....
Address .....
City, State .....

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

A "stock quotation" that pays big dividends

SIMONDS ABRASIVE CO.

Grinding Wheels

"All the boys ask for Simonds wheels," says the storekeeper. Why? Because they can count on top production and fewer rejects with Simonds Abrasive Company wheels. They're proven producers—accurately specified for every job . . . a real investment in greater grinding efficiency for you. Free data book describes Simonds complete line of grinding wheels, mounted wheels and points, segments and abrasive grain. Write for it . . . and the name of the Simonds distributor ready to serve you.

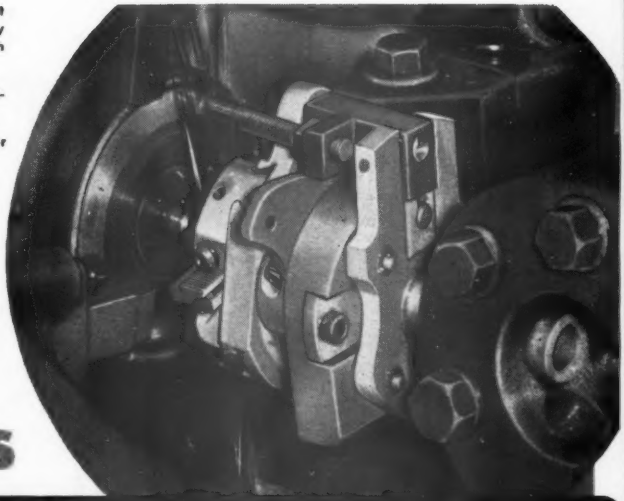
SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

+ Simple, compact design combines light weight with strength, to function dependably and accurately at high indexing speeds, with long runs between grinds.

+ All important bearing surfaces are hardened and ground and hand lapped.

+ All external surfaces are chrome plated for protection.



JONES & LAMSON
AUTOMATIC OPENING
DIE HEADS

for Brown & Sharpe Automatics and Small Turret Lathe Applications

Designed and built for high production quality threading, these new J&L dies perform with smooth, easy action, unusual repetitive accuracy, and year 'round dependability at low cost. They will give you maximum productive machine hours each day.

No. 16-S is for use on No. 00 and 00G and No. 0 and 0G Brown & Sharpe Automatics and small turret lathes. It uses long wearing ground thread, radial type chasers *with two cutting* edges. These DUALIFE chasers are easily and quickly removed and replaced in their holders. When one edge wears out, just turn them over, and you have the equivalent of a new set of chasers. Minimum down time and maximum production result.

No. 18-S and 19-S Model 18-S is for use on No. 0, 0G and No. 2, 2G Brown & Sharpe Automatics. Model No. 19-S with wider capacity range, is for use on No. 2, 2G Brown & Sharpe machines. Both are also used on small turret lathes. They have Tangent type chasers, ground all over, incorporating the exact helix angle and thread form. They are easily removed and replaced without disturbing the head and holder assembly. Many of these chasers are interchangeable between the two models and other standard J & L Tangent Die Heads. Carbide chasers can be used when conditions permit.

WRITE DEPT. 710 FOR TANGENT AND RADIAL DIE CATALOGS

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

J&L

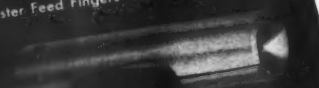
DIE HEAD DIVISION

HARDINGE
ELMIRA, N.Y.

COLLETS and FEED FINGERS for BROWN & SHARPE machines

HARDINGE Power Spring Collets (regular type)

Master Feed Fingers and Pads



Feed Fingers (regular type)

Master Feed Fingers with Adjustable Tension for No. 00, 00G, 0 and 0G Machines.

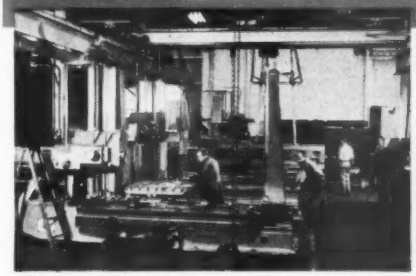
Specifically engineered, customer-shop tested and approved for Brown & Sharpe Machines, Hardinge Collets and Feed Fingers will reduce tooling costs and step up production.

Write for Catalog 36 —contains complete descriptions, specifications and ordering information.

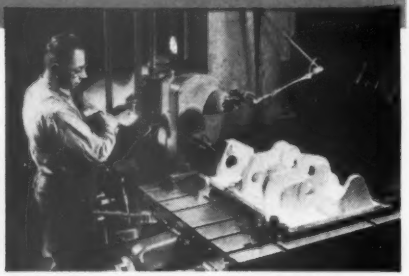
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

52 YEARS OF SPECIALIZATION

PAY DIVIDENDS IN THE DEFENSE EFFORT

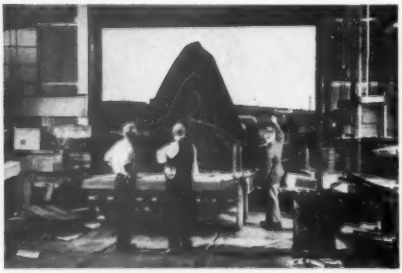


Our expanded plant is operating at peak capacity producing horizontal Boring machines, NOTHING ELSE.



In addition, many outside suppliers are helping us around the clock (using many a Lucas purchased from us in years past).

Because of half a century of specialization Lucas men maintain high Lucas standards despite vastly increased output.

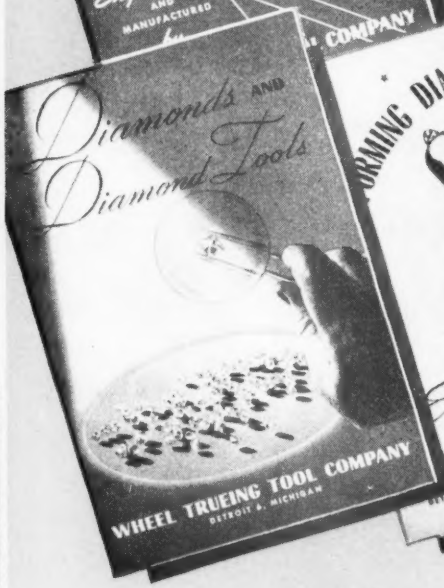


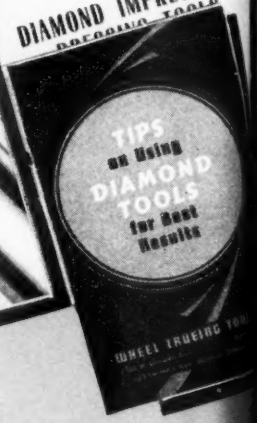
More shipments than ever, but, of course, defense priorities dictate who gets what. Perhaps this is the machine we originally scheduled for you.

LUCAS
THE NEW BRITAIN MACHINE COMPANY
A LUCAS Precision
HORIZONTAL BORING DRILLING AND MILLING MACHINE
..is well worth waiting for
The most all-around useful machine in the shop—and your order or your inquiry are as welcome today as ever.
LUCAS MACHINE DIVISION • THE NEW BRITAIN MACHINE CO. • CLEVELAND 9, OHIO

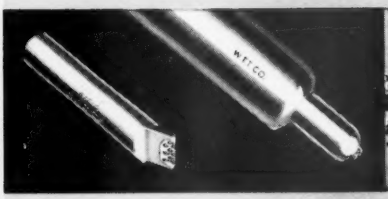
SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

FREE
TO PRODUCTION M
5 Helpful Booklet

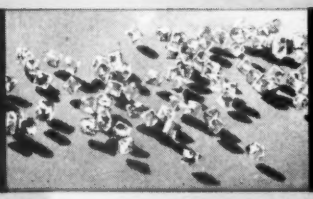




WHEEL TRUEING TOOL

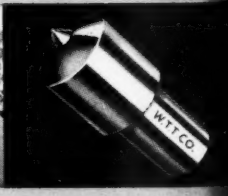


TRU-LINE BLADE TYPE DIAMOND TOOLS (Pat'd)



RADIUS FORMING DIAMOND TOOLS

UNMOUNTED INDUSTRIAL DIAMONDS



STANDARD and SPECIAL DIAMOND TOOLS OF ALL KINDS

FOR 42 YEARS

AMERICA'S FINEST

DIAMONDS and DIAMOND TOOLS

For 42 years we have been supplying American industry with the pick of the world's industrial diamonds and with Truco Diamond Tools—"engineered to their job" and guaranteed to do it. If you like to select your own diamonds, send for our approval packages, assembled from one of the world's largest stocks of fine industrial diamonds. Or, give us tool specifications and we'll engineer and build for you tools guaranteed to deliver top performance. Fast service on specials and resetting.

The booklets shown at the left are yours for the asking, with our compliments. Write for them on your letterhead telling us how many of each you require to supply your organization. Please address your inquiries to our nearest company office.

☐ DIAMONDS and DIAMOND TOOLS ☐ TIPS ON USING DIAMOND TOOLS
☐ RADIUS FORMING DIAMOND TOOLS ☐ TRU-THREAD DIAMOND TOOLS
☐ DIAMOND IMPREGNATED DRESSING TOOLS

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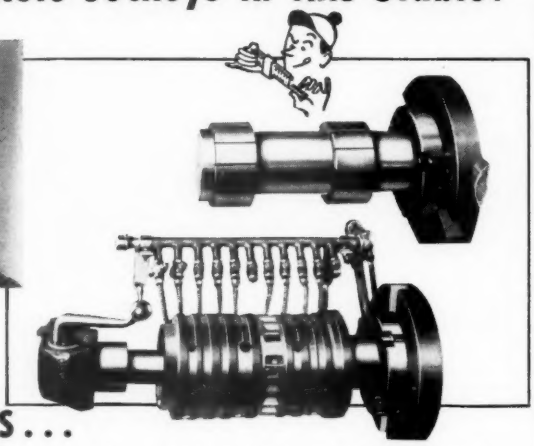
L COMPANY

Established 1910

3200 West Davison Avenue
Detroit 6, Michigan

DIAMOND CORING BIT used in mining | TRU-THREAD DIAMOND TOOLS | BORING and TURNING DIAMOND TOOLS | DIAMOND IMPREGNATED WHEEL DRESSING TOOL | GIANT DIAMOND BIT for oil well drilling

No Slide Rule Jockeys in this Stable!



ERICKSON FIELD ENGINEERS . . .

like L. M. "Bud" Lacey above—take pride in their background of really practical experience in getting the utmost in precision, speed and production out of the machine tools now in your plant.

A typical example of Bud Lacey's solution to a problem, through use of a precision holding tool, is the ERICKSON mandrel illustrated. It is designed to securely hold a cylinder for 11 simultaneous cuts while maintaining concentricity of ±.001". Use of this tool saves 99% of formerly required inspection time; rejects have been practically eliminated and production increased phenomenally.

Let an ERICKSON engineer demonstrate how your production rates can be stepped up through use of one or more of the famous ERICKSON Precision Holding Tools

THINK OF THESE ERICKSON TOOLS IN TERMS OF YOUR PRODUCTION PROBLEMS:

- **COLLET CHUCKS** — prolong tool life, permit stubbing. GUARANTEED Accuracy of .0005" T.I.R. One Erickson Collet replaces 7 single purpose collets.
- **FLOATING HOLDERS** — correct both angular and parallel misalignment.
- **AIR CHUCKS** — compact, fast acting, tremendous gripping power.
- **EXPANDING MANDRELS** — Erickson principles applied to I.D. Holding.
- **SPEED INDEXERS** — operate by air or hydraulics, vertically or horizontally.

Write for Catalog "J" Today

A-5533

ERICKSON TOOLS

DIVISION OF THE ERICKSON STEEL COMPANY

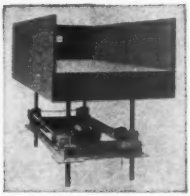
2314 J HAMILTON AVE. • CLEVELAND 14, OHIO

Portelvator; fixed position; pit installation for positioning truck and trailer beds to loading platform.

Portelvator; portable, elevating, tilt top; to facilitate removal and emplacement of bus motors.

Portelvator; portable, elevating; for the movement and positioning of automobile body dies.

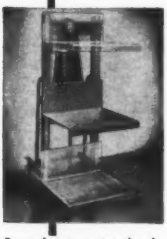
Portelvator; fixed position, automatic, self-leveling; for sheet feeding operation.



Portelvator; fixed position; pit installation for "below and above floor level" operation; sheet feeding.

Portelvator; standard style "A"; capacity, 2000 pounds; lift, 15".

Portelvator; fixed position; basement installation for extra high lift from ground floor.



Portelvator; standard style "S"; capacity, 1000 pounds; lift, 52".

Portelvator; fixed position, roller top, elevating, die transfer table; self-loading and self-discharging; capacity, 25 tons.

Focus

on the

MOVEMENT and POSITIONING

of

TOOLS and MATERIALS

The devices shown here are typical of standard and special PORTELVATORS© regularly used by industry to effect the smooth movement and accurate positioning of tools and materials. The record of production economies brought about by the use of such devices is astounding.

Doubtless the application of a similar device will improve your production also. We will be happy to furnish you with details of construction and operation. Ask also for our Bulletin P-502 which gives full particulars about standard Portelvators.

THE *Hamilton* TOOL COMPANY

832 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

UNBRAKO CAP SCREW head and threads are strong

Controlled fillet and unbroken flow lines, following the contour of head and threads, eliminate the straight planes of weakness along which shear can occur. Consistently high tensile and fatigue strength, non-slip internal wrenching and fast, easy assembly with the knurled head are other UNBRAKO features that save time and money.

Write for descriptive literature. STANDARD PRESSED STEEL CO., Jenkintown 36, Pennsylvania.

Standard sizes, #4 to 1", are available from distributors' stocks.

SPS JENKINTOWN, PENNSYLVANIA

UNBRAKO® SOCKET SCREW DIVISION CAP SCREWS • SET SCREWS • SHOULDER SCREWS • DOWEL PINS • PRESSURE PLUGS

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

From Milne

A COUPLE OF FAST ONES TO TRY ON YOUR TOOLING PROBLEMS—

MILNE'S
GRAPHITIC
TOOL STEELS

Another Part Of Milne's Complete Line of Solid and Hollow Tool Steels.

ENTIRE LENGTH KOLORKOTED FOR QUICK, SURE, PERMANENT IDENTIFICATION.

GRAPH-TUNG
JIC—WW
Water or Brine Hardening

★ Extra High Resistance To Abrasive Wear
★ Remarkable Non-Seizing Properties
★ Easier Machining Than Other High Wear-Resistance Steels

Kolorkoted Purple & Gray

For deep draw dies, automotive body dies, cold shell-nosing dies, cold heading dies, draw punches, coining dies, lathe centers, blanking dies, blanking punches, cold heading quills, bar and tube draw dies, cold extrusion plungers and other uses.

Manufactured By TIMKEN ROLLER BEARING CO.

GRAPH-MO
JIC—O6
Oil Hardening, Non-deforming

★ Faster, Easier Machining Than Standard Oil-Hardening Tool Steels
★ Extremely High Wear Resistance
★ Non Galling. Does Not Score Or Pick-up

Kolorkoted Pink & Gray

For forming, drawing, sizing, flanging, embossing, and combination dies, work support blades, forming rolls, machine parts, plug, thread and ring gauges, cams, bushings, mandrels, fixtures and other applications.

Manufactured By TIMKEN ROLLER BEARING CO.

Graph-Mo and Graph-Tung are a pair of faster-machining, longer-wearing tool steels that can help you cut tooling costs. In both, diamond-hard carbide particles guarantee super wear-resistance while free graphite insures faster, easier machining and non-seizing properties. Make Kolorkoted Graphitics from Milne standard for your tool room. Write Milne for free bulletins.

AM-12

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A. MILNE & CO.
Established 1887
745 WASHINGTON ST., NEW YORK 14, N.Y.
America's Leading Tool Steel Specialists
Complete Line Of Tool Steels—Hollow and Solid

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

New Flexible Sealing...

T-J AIR CYLINDER

Designed with revolutionary application of

Super-Cushion

It's *sealed with pressure*—a revolutionary T-J application of flexible sealing that insures positive cushion action combined with automatic valving action for fast return stroke . . . eliminates binding and sticking . . . operates with *low friction, minimum wear,* and *added power* due to higher efficiency.

More PLUS features! New type packing nut incorporates a piloted diameter, assuring perfect alignment. Improved rod packing increases sealing efficiency.

Piston rod and internal cylinder tube surfaces are hard chrome plated—a standard practice with T-J for over 15 years.

Write for bulletin 252 . . . The Tomkins-Johnson Co., Jackson, Mich.

1. Metallic rod scraper to protect rod bearing and packing from dirt and grit.
2. Wrench flats.
3. Self-adjusting chevron type packing.
4. Permanent type adaptor ring.
5. Hi-tensile tie rods.
6. Heavy duty, hard chrome plated rod.
7. Generous fillet reduces stress concentration.
8. "O" ring static seal.
9. T-J new flexible cushion seal insures positive cushion with automatic valve action for fast return stroke. (Patent applied for)
10. Fine cushion adjustment.
11. Heavy wall precision honed hard chrome plate.
12. Controlled packing compression with metal to metal contact.

36 YEARS' EXPERIENCE (T-J)

TOMKINS-JOHNSON

RIVETERS · AIR AND HYDRAULIC CYLINDERS · CUTTERS · CLINCHERS

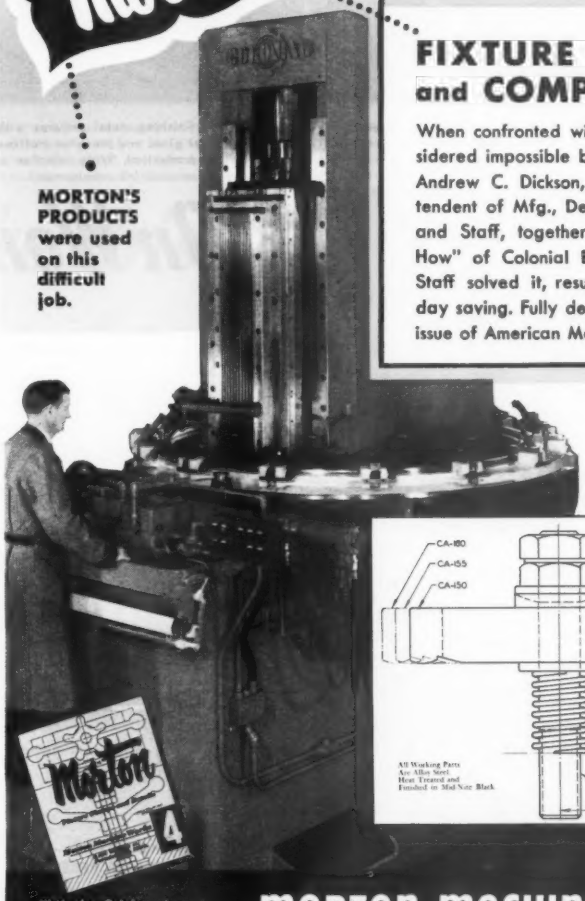
Specify Morton

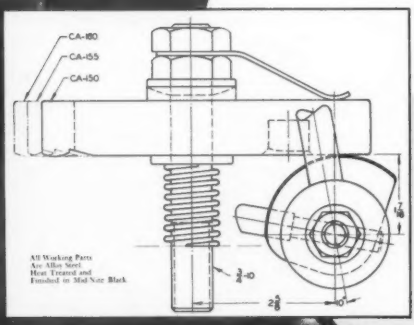
YOU, TOO, CAN BE PROUD OF YOUR PRODUCTION RECORD!

MORTON'S PRODUCTS were used on this difficult job.

FIXTURE CLAMPS and COMPONENTS

When confronted with a problem considered impossible by the experts, Mr. Andrew C. Dickson, General Superintendent of Mfg., Detroit Tank Arsenal, and Staff, together with the "Know-How" of Colonial Broach Engineering Staff solved it, resulting in a $400 a day saving. Fully described in March 3 issue of American Machinist.



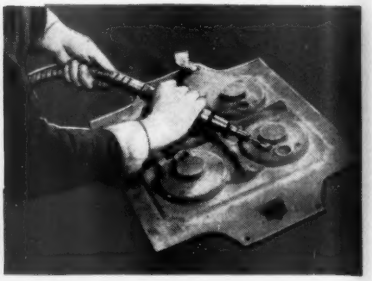


Write for Catalog of most complete line in the industry. Full size tracing templates of each product. Economize with MORTON.

MORTON MACHINE WORKS
2421 WOLCOTT STREET • DETROIT 20, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

DEBURRING and removing sharp edges on rough cast surfaces is short work when you use files and cutters of the right shape . . . driven at correct speeds . . . tools last longer, too.



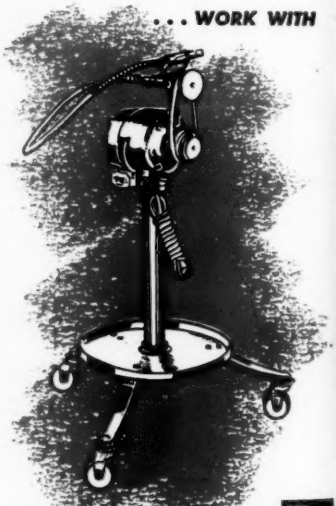
FILING and finishing metal patterns with Haskins equipment gives you precision craftsmanship . . . quality production. Wide selection of files and cutters meets all job requirements.

GRINDING rough castings is another tough job made easy with Haskins dependable power. Because you handle only a light handpiece, not a heavy motor, work is faster, labor cost lower.

WELD BLENDING calls for Haskins power with drum and disc sanding attachments for smooth, flawless seams.

On Work

. . . WORK WITH

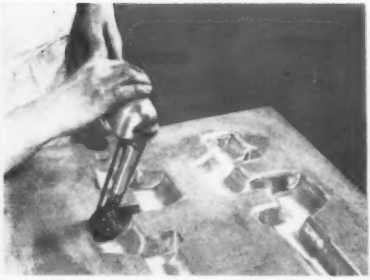


CHOICE OF MOUNTING—
SUSPENDED, BENCH OR PEDESTAL

HASKINS

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

POLISHING precision molds to mirror-like finish assures constant, pit-free molding. Here an HS4 machine with special felt bob does the job better—with less operator fatigue.



HI-SPEED GRINDING for more accurate and finer finished die cavities. Special offset head is typical of Haskins special engineering of grinding and finishing attachments.

like this...

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FLEXIBLE SHAFT EQUIPMENT

You can take the work out of jobs like these in your plant when you put Haskins flexible shaft equipment to work—stepping up production . . . quality . . . doing the job easier at lower cost. For Haskins brings you profit-making advantages like these: constant power for sustained operation, even on heaviest duty . . . handling only a light handpiece, not a heavy motor, operator fatigue is reduced, work standards are higher . . . higher speeds mean better work, faster, with longer tool life . . . multi-speed design gives you one machine capable of many jobs.

Write us today for recommendations on those tough jobs of yours. R. G. Haskins Co., 605 S. Washtenaw Ave., Chicago 12, Ill.

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BUFFING a finish to high luster is another quality job done better by Haskins. Right angle head and right buff allow the operator better control for better work on lacquered metal or wood surfaces.

Send Us Your Problem To-day

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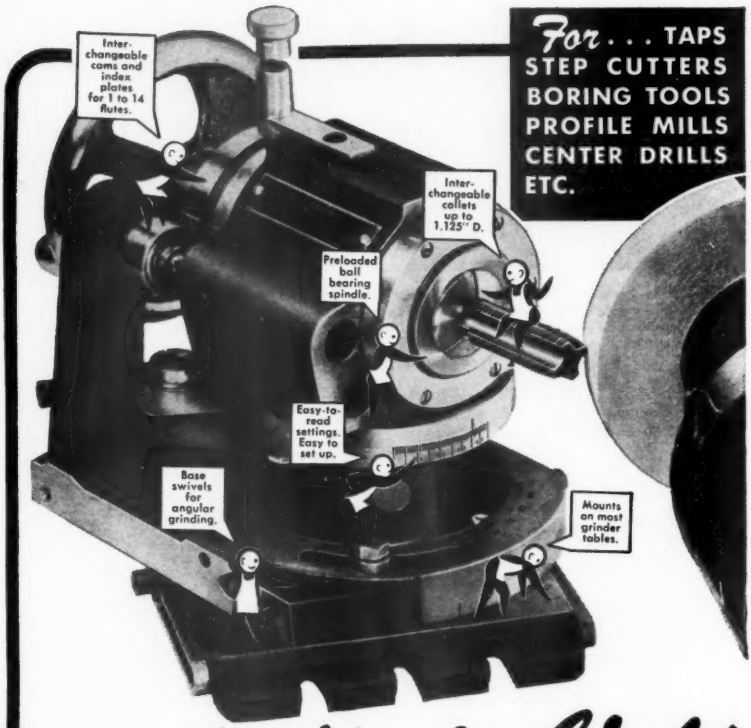
Inter-changeable cams and index plates for 1 to 14 flutes.
Inter-changeable collets up to 1.125" D.
Preloaded ball bearing spindle.
Easy-to-read settings. Easy to set up.
Base swivels for angular grinding.
Mounts on most grinder tables.

For . . . TAPS
STEP CUTTERS
BORING TOOLS
PROFILE MILLS
CENTER DRILLS
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More Cuts Per Grind
Better — Freer Cutting

Reduce perishable tool costs with this preferred grind on your straight and spiral flute production cutters — Easy and fast as ordinary angular relief grinding.

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ROYAL OAK TOOL & MACHINE CO.
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D·S RADIAL RELIEF GRINDER

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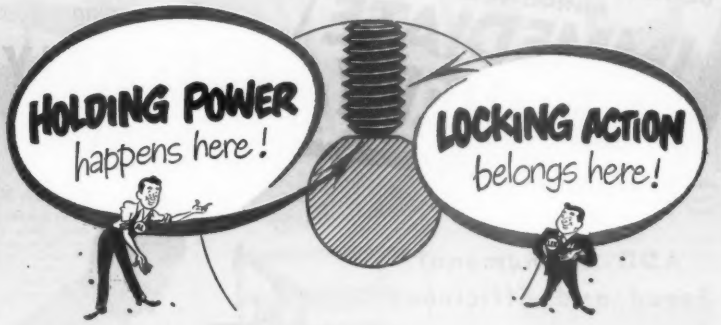
WHEN YOU SPECIFY SET SCREWS, REMEMBER . .



To do its job a set screw must *hold firmly* against both rotation and sideway motion, and it depends entirely on the *point* for this holding action.

Allen O screws hold better because they have the strength to permit firmer tightening, and because the points are designed *only* to produce maximum holding power.

Allen design does not compromise the holding power of the point in an attempt to make it perform a locking function too. Allen O screws require no locking action at the point, because of their high uniform accuracy of fit, pitch diameter and perfect thread lead. This provides maximum thread contact with ample friction to lock the screw in position during use and *re-use* under extreme vibrating stress.

THE **BUY** WORD IN SOCKET SCREWS IS **ALLEN**

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HEADLINE NEWS

EXTRA ***

DETROIT POWER SCREWDRIVER ANNOUNCES

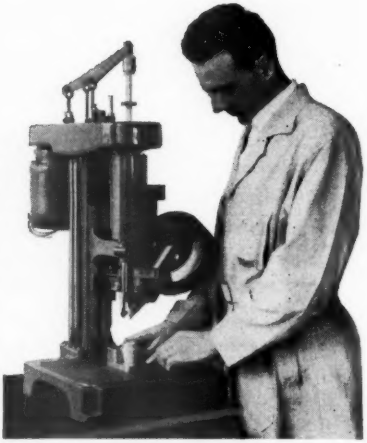
IMMEDIATE DELIVERY

No Waiting—Start Now to Benefit with These Outstanding

ASSEMBLY AIDS

ADD Phenomenal Speed and Efficiency

No need to continue slow, costly hand methods; use Detroit Power Screwdrivers and profit immeasurably by increased production and economy. Drive all types of screws with almost incredible speed, as fast as one to two seconds per screw. Detroit Power Screwdrivers play an important part in the present-day industrial capacity to produce rapidly . . . So, now that prompt deliveries are made possible, send sample assembly for production estimate at once and let our 26 years' experience as specialists in assembly problems serve your individual needs. Also receive our catalog describing in detail our complete line of POWER SCREWDRIVERS, HOPPER FEEDING UNITS, NUT DRIVERS and SPECIAL ASSEMBLING MACHINES.



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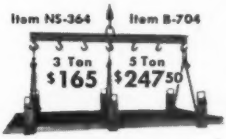
Item B-704 — 5 Ton $247.50



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Handles sheet steel bundles, any size 0" to 9" thick, 18" to 48" wide and any length.

Vertical DRUM LIFTER
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For handling open and closed steel drums in vertical position, by crane or hoist. All-steel, with heavily welded chain. Sure-hold safety barrel grip. Saves plant space. Use for either high or low ceiling condition.

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A barrel tilt for controlled, precision dumping or pouring. Ideal for chemicals, solvents, powders, etc. Turns 360° through worm drive.

Equipped with two safety type locking devices and all-steel, welded yoke. Hand-operated chain drive

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Automatic END DUMP

Ideal for handling and dumping of sand, scrap, castings, stampings and other heavy materials. Locks during loading by safety catch. Built for lift or fork truck or with casters. All welded construction. Standard size ½, 1 and 1½ yds. capacity, other sizes on request.

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Reinforced heavy sheet steel, ½ cubic yard capacity, two 8" semi-steel wheels and two 4" metal swivel casters. Wt. 125 lbs.

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You get a wider work range than with any other machine this size. You can machine at *any* angle—vertical, horizontal or both. You can mill, drill or bore at *any* angle. Hence resetting isn't necessary. Just change the machine—changing is quick for vertical and regular horizontal milling. Jobs are done faster and better... at less cost. • It's Universal • Rugged • Easy to Operate.

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Write for details and specifications.

Bulletin 10.

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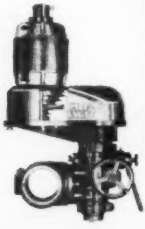

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All-Angle

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maintains close tolerance production

for **OTIS ELEVATOR COMPANY**

The 3 station progressive piercing and blanking die, mounted in a Producto Die Set, produces the Magnet Frame (shown at right) for Otis Elevator Company. It is used in the Magnet Switches which compose the floor selector system for automatic stops thru the push button panel.

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The excellent performance of this die is tied right in with the accurate alignment of the Producto Die Set guide pins and bushings and precise parallelism of punch and die holder. Rejects are minimized, die life extended and improved production assured. Specify Producto for competitive advantage in today's high production economy Send for New 72-Page Catalog No. 10 . . . complete listings of all Producto Die Sets and Accessories.

Actual size of Magnet Frame, 1-9/16" x 4-13/16"

Call **PRODUCTO** in your classified telephone directory . . . representatives in 35 main stamping centers.

THE PRODUCTO MACHINE COMPANY

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Have Outstanding Features

If you are thinking about new metal-cutting equipment, it will pay you to investigate the outstanding features of the Johnson Metal-Cutting Saws. Their exclusive design, ample capacity and ruggedness speak for themselves. These efficient low-cost machines offer the highest value available today.

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. . . SO MUCH POWER PER POUND

MEET the new Rotor Vertical Air Grinders! Never before have you had so much power in vertical air grinders . . . for such light weight! They're well balanced . . . easy on the operator. Here are *new* features to speed up your metal removal.

AIR O'TOOL

THE NEW B-35

Weight	10¾ lbs.
Height	7½ inches
Spindle	⅝"—11"
6000-5500-4500-3500 RPM	

THE NEW B-12

Weight	10 lbs.
Height	7 inches
Spindle	⅝"-11"
6000-5500-4500-3500 RPM	

For cup wheels, sanding pads, cut-off wheels, wire brushing.

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They're PRECISION GROUND-FROM-THE-SOLID

Quality Engineered

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BORING BITS & TOOLS
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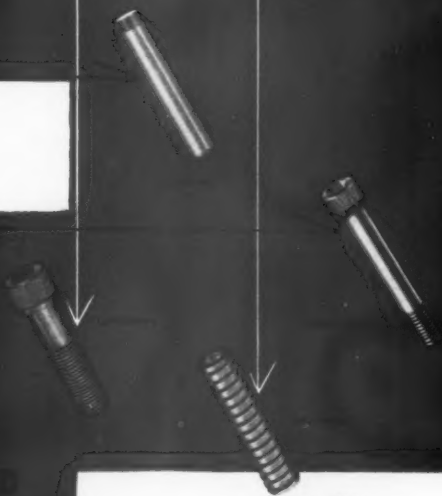

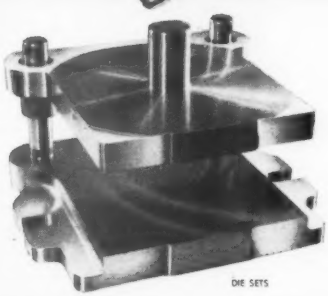

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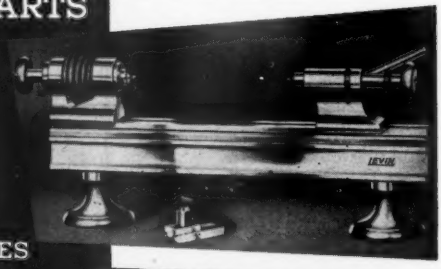

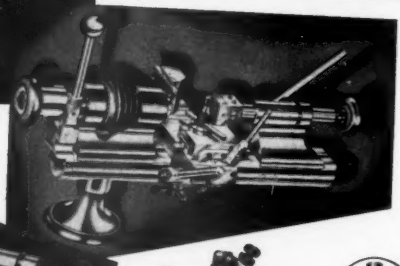

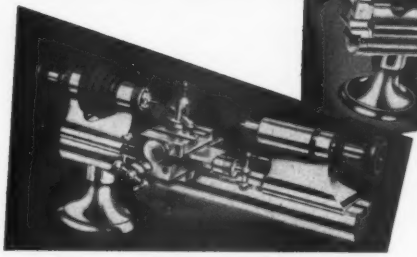

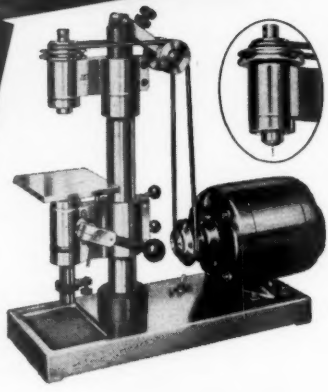

An extremely sensitive drill press for very small drills down to .002". Drills held in accurate collets to minimize deviation. Spindle run-out less than .0001". Finger tip control enables operator to feel progress of drill.

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Perfect alignment of pins and bushings mounted with pre-loaded ball bearings close more accurately, produce less scrap, yield more pieces per grind and dies last longer. Also eliminates binding on extended or overhung dies.

A dab of cup grease at regrinding time is all the lubrication that is necessary. You can forget about maintenance when your die is in the press. Frozen bushings, scored pins and chipped dies are rare occurrences. Frequently an entire production run can be completed before regrinding is necessary.

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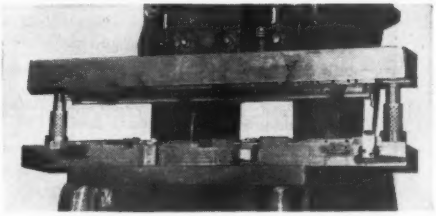
Save 15 minutes out of every 60 in die assembly . . . no pry bars, lead hammers or die pullers necessary.

Perfect alignment on every try.



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LEMPCO DIE SETS are priced competitively

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PRESS ROOM EQUIPMENT
INCREASE PRODUCTION
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Accurate Feeding • Reversible • Easy to install • Highest quality

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155 ORANGE ST., PROVIDENCE 3, R. I.

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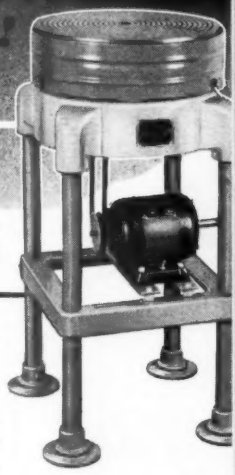
"PROGRESS ON PARADE" 204
Each and every one of these new machines, tools and accessories is capable of saving money or increasing productivity.

Precision
LOW-COST
LAPPING
with Production
Speed!



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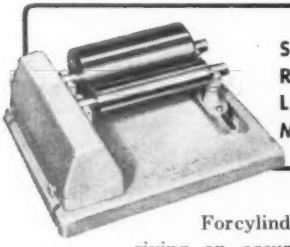
Designed for accurate lapping any material where a perfectly flat surface is important. Finishes to extremely close tolerances are produced.

The perfectly flat surfaces of sliding and rotating parts, air and liquid tight seals plastic and die casting molds are quickly accomplished with this machine tool.



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For cylindrical lapping giving an accurate, mirror like finish in less time than any other method. Ideal for plug gauges. Saves as much as ⅔ in lapping time.

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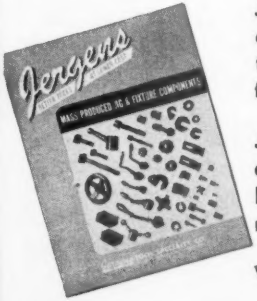
STANDARDIZE WITH JERGENS COMPONENTS

JERGENS MASS-PRODUCED COMPONENTS: Realize big savings in design, tool room and production facilities—use Jergens components as standard in your plant. All of the more than 375 component parts are precision made of heat-treated alloy steel. Jergens Standards hold up in the toughest applications usually outlasting the jigs and fixtures on which they are used.



JERGENS SINE FIXTURE KEYS: Save up to 50% in labor costs alone in the laying out and milling of fixture plates—the "S" Fixture Key requires a bored hole in lieu of milled fixture key slot.

JERGENS SOFT CHUCK JAW BLANKS: Made of high quality steel accurately machined to American Standard Form. Standard heighth jaws in stock—specials on short notice.

WRITE FOR YOUR COPY OF JERGENS NEW FOLDER TP-6

Jergens TOOL SPECIALTY CO.

712 E. 163rd ST. . . . CLEVELAND 10, OHIO

we still don't know

enough about General Eisenhower; where he stands and what he stands for. We have all the respect in the world for the man himself, his patriotism, unquestioned integrity and capabilities as demonstrated by his record to date. That this record is primarily one of military accomplishment is a handicap that he has yet to overcome when he is free to throw himself upon the tender (?) mercies of his political and news gathering contemporaries.

General MacArthur has said that any coalition between Republicans and Democrats to further the candidacy of General Eisenhower would be a step toward a one-party government. This would be against the premises and successes of our political history.

Even worse, could the ascendency of Eisenhower to the White House presage a trend toward a three-party government — i. e. Democratic, Republican and Military? Would the ascendency of a man steeped in military training, thinking, and action, to the country's top job be construed within the labyrinth of the Pentagon as an opportunity to "come and get it"; to form an unprecedented pressure group?

Military men are particularly history-conscious. At the present writing, General Eisenhower's position with future historians is secure and enviable. In fairness, it should be granted that were he to become President of the United States, he would so conduct his affairs of office as not to jeopardize that standing. He would have in his mind's eye the picture of his predecessor, a President against whom in his last term, there were threats and talk of impeachment.

Way above the level of 1952's political conventionings and campaignings, the question which we have to face up to is the one of the survival of "our way of life" vs theirs', meaning the world-wide struggle between the labor-capital partnership and communism.

Let there be no mistaking the fact that what has made this country what it is — what has given us the world's highest standard of living — is the working liaison between capital and labor as it has been perfected in this country. We use the word, perfected, advisedly because both labor and capital have been guilty, at times, of deviations from the **mutual** good. The fabulous end result is what we see and experience everywhere and everyday, particularly in comparison to the "living", so-called in other countries.

Capital has furnished the where-with-all and labor has furnished the do-all. With an economic climate that is compatible to the interests of both, i. e., a fair return on invested capital and a high living standard for labor there are no limits to the well-being which we can attain.

Enhanced by expanding markets, increasing population, technological advances, the picture is one not to be tampered with by blind political partisanship, ineptness in government, vested interests or hero worship. All we have to lose is **everything** we have.

The question that each one of us must resolve for himself therefore is that of determining the fitness of any candidate for the biggest and toughest job in the world. It calls for taking a look at the record.

Is he above party politics? Has he the true concept of public service? Has he worked for the mutual interests of both capital and labor? Does he stand for economy and integrity in government? Has he demonstrated that he cannot be used by selfish interests? Has he evidenced the best understanding of how to preserve "our way of life"?

The next few months will provide the answers to these questions. Never before has the choice been of such portentious import.

E. Willard Pennington

editor

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Effective Tooling for Sheet Steel Products at Whirlpool

Base rings for washing machines are formed in McKay rolls but piercing for mating parts involves some special hydraulic radial setups. Presswork includes several unusual operations, among them are some performed on progressive dies for hinge components.

by **Leo Harman**
Die Engineer, Press Shop
WHIRLPOOL CORPORATION
St. Joseph, Michigan

Production of home laundry equipment is dependent to a large extent upon sheet metal operations even though many other types of metal products are included in all completed units built by this company. Consequently, it is not surprising that major manufacturing departments of Whirlpool Corporation, the world's largest producer of such equipment, employs first rate setups for working sheet steel. Naturally, many operations follow conventional lines but those described include certain features likely to interest shop men in the same or related lines of work.

Base rings are part of the main housing of non-automatic Whirlpool washing machines. They surround and inclose the tub and constitute the basic part of the frame to which stamped legs are attached. In production, cut lengths of flat strip steel are first given a channel-like section and then are converted into rings as the final operation on four-stand McKay rolls shown in Figures 1 and 2. One man feeds strips by hand to the first stand (right in Figure 1) and the rolls in this and the next two stands form flanges to provide the sectional contour specified.

Fig. 1. Set of McKay rolls that form the base ring for a conventional Whirlpool washing machine. The feed end is at the right.

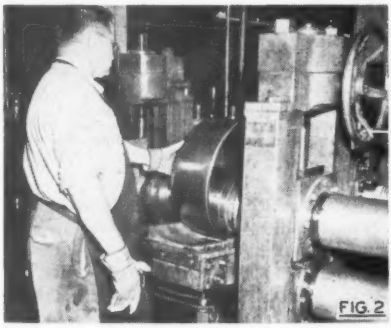


Fig. 2. After flanging in the McKay rolls, the strip is formed into a ring at the final station here shown. As ends of the ring are not joined until later, the ring can be removed without using open end rolls.

This formed strip continues through the fourth stand where a set of rolls convert the flanged work piece into a ring. When thus rolled, the ring has an open joint and enough spring so that it can be lifted off the upper roll by the operator shown in Figure 2, hence open end rolls are not needed. Forming includes an external offset near the edge that becomes the lower one in assembly.

Several radial holes for mating parts are required in the ring, and, although they might be pierced when the ring is flat, better results are obtained by piercing in radial setups like that illustrated in Figure 3. In such setups, the dies are inside the ring but are so made that the

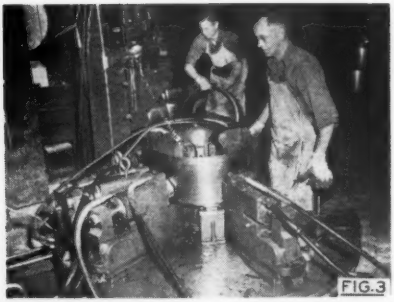


Fig. 3. Special setup in which several holes are pierced radially in the base ring at one time. Both clamping and piercing are done hydraulically, punches moving inward into dies within the ring.

ring is easily placed over and removed from the dies. Clamping as well as piercing are done hydraulically and the dogs that are pulled down in clamping have their ends resting on the external step mentioned above and help to center the work piece.

Punches are set radially on the table but, before they do the piercing, clamping elements surrounding the punches move inward and clamp the wall of the ring against the faces of the dies inside the ring. Then the punches are advanced inwardly, pierce the holes all at once and push the slugs through the dies before being retracted. As dies and punches are set originally to correct angular position, holes are always spaced correctly. If any burrs are left, they are always inside where they are of little or no consequence.

Some setups of this type have six or more radial slides each of which pierces one or more holes. Upon pushing a start button, all punches move automatically, simultaneously and almost instantly after clamping is done, hence the time per cycle is only very slightly longer than the time needed to load and unload the work piece.

A somewhat similar setup, Figure 4, is employed to pierce radial holes in a drum for a clothes dryer, but, in this case, as there is no in-turned flange at one edge, the inside parts can be solid and piercing can be done after the ends of the drum ring have been joined. As it is important that the drum is all the way down over

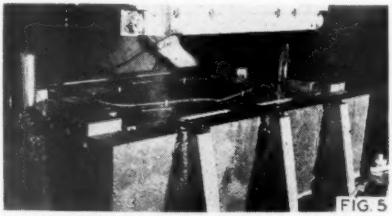


Fig. 5. Setup for blanking legs for nonautomatic washers. Blanking is followed by the first forming operation in a second die.

Fig. 4. Radial holes in the drum for a clothes dryer are pierced in this setup, similar to that in Fig. 3, but, as the ring is not flanged on the open end, the ends can be joined before piercing is done.

the die, plungers that control light switches are so arranged that they close the switches and a red pilot light comes on to indicate proper location.

When the light goes on, a button is pressed, the work piece is clamped hydraulically and the punches advance, piercing the holes and then retract automatically. Although clamping and piercing are done hydraulically, pressure is applied to the hydraulic fluid by a piston that is air operated off a shop line. When the air is admitted to the pressure cylinder, the air piston operates a ram of smaller diameter that puts pressure on the hydraulic system. This pressure operates the clamps and the punches, each of which is moved by a hydraulic plunger. With this setup, it is not necessary to have a separate hydrau-

lic pump on the machine.

Each non-automatic washing machine requires four legs and they have to be drawn to a U-shape section that is domed or rounded off for good appearance at the top end and is turned in to provide a caster plate at the lower end. Open edges of the U have to be trimmed to fit the contour of the base ring and also to provide small projections along this contour. At assembly, the projections are heated by welding current and are then flattened by the pressure applied as they reach fusion temperature and welds take place. In this case, the projections are solid to form tooth-like projections along the edge, as distinct from blisters on surfaces such as are commonly used in projection welding.

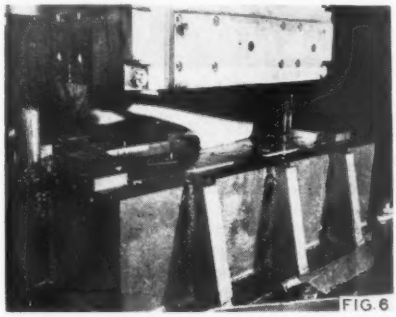


FIG. 6

Fig. 6. Initial forming of washing machine legs is done in this die but subsequent forming as well as some trimming are needed.

Legs are drawn from sheet stock that is first blanked to the contour shown in Figure 5. Drawing is done in a No. 610 Niagara press. Figure 6 shows the formed piece ready for removal from the die.

Stamping operations on the leg are completed in a second die mounted in a second press, Figure 7, that has three stations of which one is loaded by an operator at one side of the press and the other two by an operator at the opposite side. In the first position, cam operated punches move in and trim the side contours that include the projections above mentioned. At the second station, the top end is trimmed with the work piece held vertically on a horn die. Finally, the stamping is laid horizontally and a cam die moves in to form what becomes the lower end of the leg to receive a caster plate. The production rate on these two presses is 400 legs an hour.

FIG. 7

Fig. 7. Three separate dies are used in this single setup in a large press. In the first, cam actuated parts trim edges to leave projections for subsequent welding. The top end is trimmed in the die at left and the lower end is formed in the die at the right.

A quite different leg is employed on an ironer and is shown after the first and second steps in its production in Figure 8. For the first operation, Figure 9, a die in a HPM hydraulic press is employed to draw a pocket, seen in Figure 8. Next, a second die, in which the work piece is located from the pocket, forms the end and two sides, as at right in Figure 9. A third die

(Continued on page 176)

FIG. 8

Fig. 8. This HPM hydraulic press draws a deep pocket in the leg for an ironing machine, shown in Fig. 9.

Press line for making floor pans includes equipment for automatic transfer between most operations. Subassembly, including several smaller stampings, is effected largely in four automatic press welders.

Highly Mechanized Plant Does Fast Work On Body Stampings

Few plants, even in the highly mechanized automotive industry, can handle stamping, especially those of large size, with so little manual labor as is required in the comparatively new Fisher Body plant at Hamilton, Ohio. In this plant, having an large investment in press equipment, about 1500 tons of steel sheet a day can be converted into body parts if this amount of steel is available. Presses range up to 1000-ton capacity and the largest press bed measures 100 x 200 in.

Typical of the press lines equipped to make stampings of large size is that producing floor pans for Chevrolet cars. Blanks for this job measure 64 x 91 in.,

by **Herbert Chase**
Forest Hills, N. Y.

are of 20 gauge steel and normally would have to be fed to the press by two men, as in Figure 1. When the stack of blanks is placed on a new type of air-magnetic feeder, however, a single man can do the loading. The feeder picks up the top sheet with magnets and air jets blow between it and the next sheet so that the top sheet is easily transferred to a ball feeder cradle. From this, an air-operated pusher shifts the sheet into the die.

Fig. 1. Loading a 64 x 91-in. blank of 20 gage sheet steel into the draw press that produces floor pans for Chevrolet cars. The cradle on which the sheet lies includes an air-operated pusher to move it into die.

Fig. 2. Air-operated hands back of the pan draw press pick up the stamping and transfer it onto an air-operated shuttle that, in turn, transfers it into the trim press.

As soon as the draw die clears the work piece, it is gripped by the double air-operated hands, shown in Figure 2, and is drawn out onto the air-operated shuttle, a part of which is shown, for a three-stage transfer into the next press. The shuttle holds three stampings and commonly runs full but advances the drawn parts even if the draw press does not keep the shuttle fully loaded.

Figure 3 shows a drawn pan ready to be pushed by the shuttle into the next press (left) where it is pierced and trimmed. Scrap trimmed off slides into chutes and thence into gondola cars placed on the floor below. This avoids much scrap handling and the spotting of large scrap boxes on the press room floor. Air-operated kickers are applied at points where, without them, the scrap would not drop into the chutes. Some scrap, termed "offal", is in pieces large enough for use in small stampings and is segregated for this purpose, while other scrap in gondolas

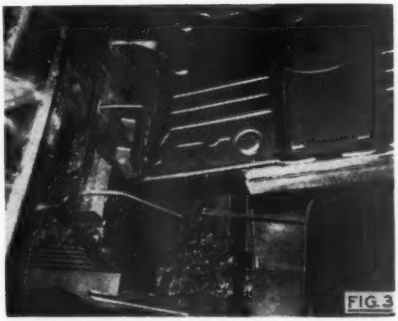


Fig. 3. Drawn pan on the shuttle that transfers it into the trim and pierce die at left. Scrap cut off drops or is pushed into chutes down which the pieces fall into gondola cars on the floor below.

which, when loaded, are dumped into a scrap baler.

As the trim press is loaded by the shuttle and is unloaded by air-operated hands, only one man is needed at this press and he does not touch the work piece but only watches to see that the loading is properly done and then trips the press. Unloading is done onto a second shuttle, similar to that just mentioned, and this second shuttle loads the third press in the line. In this press are dies that perform flanging and added piercing operations and "spank" or restrike the work piece, sharpening some radii and bringing the stamping to final size.

One man attends this press but does no handling operations. He does operate three foot buttons one of which closes the press, one operates a pusher that moves a loaded truck away from the press, and the third operates a second pusher that shifts an empty truck into position to receive its load. In general, presses in this line operate at the same speed but they are so interlocked that jams cannot occur if the presses do not keep in step.

Air-operated hands unload the third press and drop the stamping onto a truck spotted back of this press. At this point, however, a helper is needed to guide the stampings and to see that they stack as desired, as shown in Figure 4. When stampings leave this press they are completed and ready for assembly with smaller stampings. As this is done in an area some distance away, the transfer is effected by trucks that are towed by a "mule." If the inspector spots defective stampings, he shifts them to a spare truck for this purpose and repairs are made before these stampings go to assembly.

This plant does not build complete bodies but many of the stampings undergo some initial assembly operations before being shipped to assembly plants. This is true of the pans, the stamping of which was just described. Most of the parts added are stampings and in some cases are built into subassemblies before they reach the pan assembly setup.

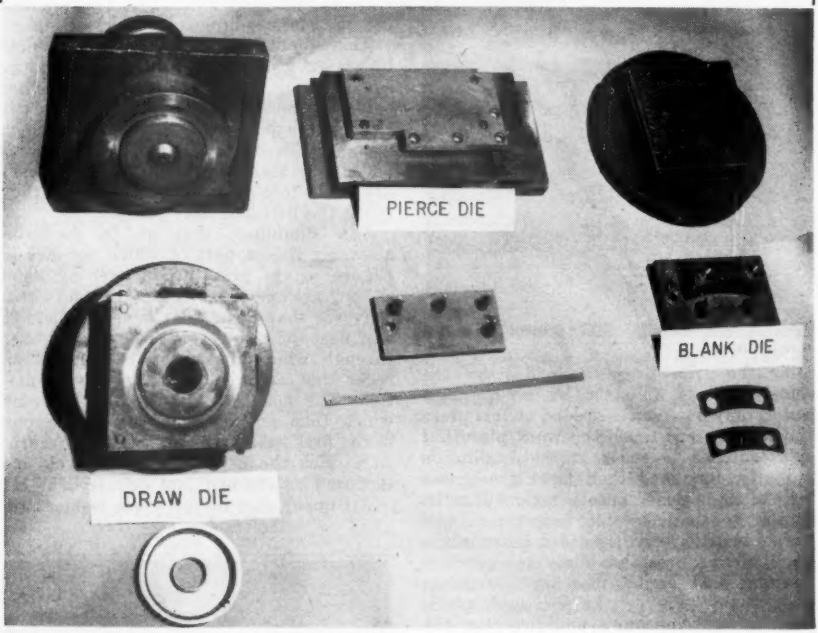
Pan stampings that go to the subassembly line, a part of which appears in Figure 5, are first turned over by hand as they are loaded on an intermittent chain conveyor that elevates and carries them to the first of four spot welding presses through which the pans are handled on racks that are given a reciprocating motion. The chain loads the pan on the rack which then advances and drops the pan in the first welding die and then is returned to pick the next part as the weld die is closed on the one just delivered.

All upper dies in the press welders re-

(Continued on page 164)

Fig. 4. End of the pan stamping line where air-operated hands pick the finished stamping from the third and final press and deposit the stamping on a truck shown in the foreground.

The When and How of Short Run Dies



These tools are typical of the dies made by the Westinghouse short run die group.

Judicious application of short-run dies to specific manufacturing processes can often result directly in savings of time and money; the catch comes when trying to locate the demarcation line between short-run and long-run dies. Although experience is a major requisite in such a choice, there are luckily, some general guiding factors that can be used to evaluate each case: (1) activity (high or low); (2) allowed tool expenditure; (3) tool delivery date.

by
John Kazik and **J. R. Taylor**
Feeder and Service Division
WESTINGHOUSE ELECTRIC CORPORATION
East Pittsburgh, Pennsylvania

If the manufactured item has a short life span, or a contour that cannot be made economically on simple tools, or if the activity is in large quantities, the short-run die should be considered. Also, the cost of the item to be manufactured, either by the simple tool or short-run die method, is a factor which should be considered prior to production.

The construction cost and delivery of the short-run die is approximately one-fifth the cost and delivery of a standard die. Short-run dies are made without trip fingers, punch pads, guide pins, die shoes, spring stripper, shrink rings, standard die thickness, etc., all of which are included in standard dies.

The time-decrease gained by using short-run die instead of the simple tool method for various types of dies is:

Type of Die	Time Decrease Per Cent		
Blank	70	78	98
Bend	95	97	97
Pierce & Blank	60	71	89
Pierce & Cut-Off	60	71	89
Draw & Trim	89		
Notch & Sever	82		

The procedure used to initiate construction of a short-run die is of a simple nature and is usually accomplished by verbal agreement between the time-study man, manufacturing engineer, foreman, and the tool maker.

The tool maker plans, designs and constructs the die from an engineering drawing or sample. It is he who determines the material required, makes hand sketches when necessary, and performs the necessary machining and fitting to complete such dies. The equipment required for short-run die construction may be a drill press, band saw, lathe, surface grinder, shaper, milling machine and a bench. The finished product made from these dies requires very little inspection since the die maker is entirely responsible for die construction and operation.

Die Construction

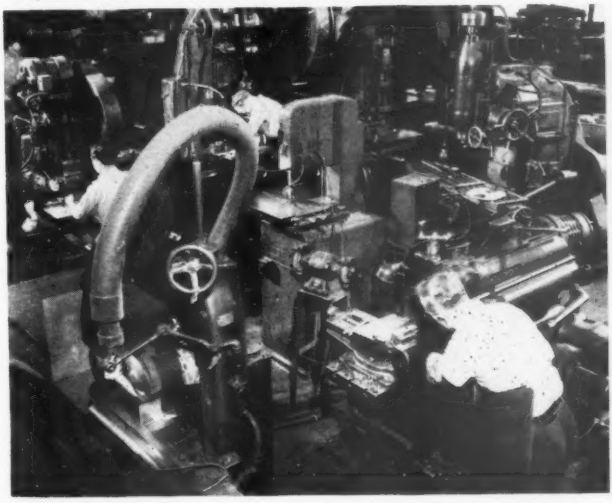
Die pieces or punches are ordered from the tool room in the approximate sizes required. Types and thicknesses of material used in die-making have been determined by practical application, and punch and die clearances are taken from company standards. Saw-cutting the blank shape through the die, stripper, and punch plate is performed in one operation by clamping the plates together. The drilling, countersinking, and reaming for the dowel rivets is completed in the same setup. Filing the blank shape through the die, stripper, and punch plate is performed in one operation.

Bottom plates on blanking dies are used when the piece to be blanked exceeds 1/16-inch thickness, or less if it is necessary to cause weak sections in the die or punch due to the design of the item. Bottom plates for pierce and cut-off dies are not generally made with the die, but are made to fit standard sizes and conditions, and are used in a universal manner.

Die thickness, stripper thickness, and punch plate thickness do not vary greatly, so average thickness of ½-inch die, ¼-inch stripper plate, and ⅜-inch plate are

(Continued on page 144)

In this manufacturing section, die-makers are responsible for die construction and operation.



Carbide Dies Offer High Production Blanking and Piercing

by A. E. Glen
Mgr., Die Sales
Carboloy Department of
GENERAL ELECTRIC COMPANY

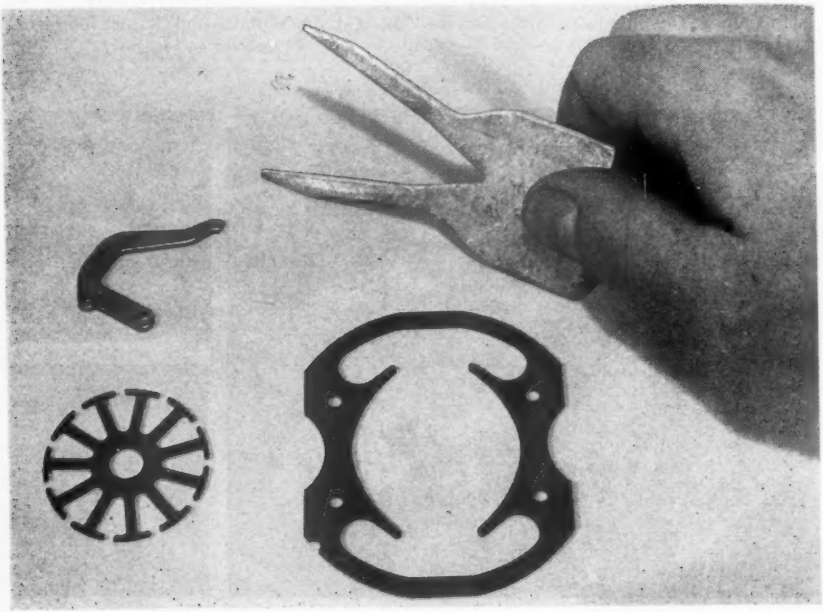
Carbide dies are now being successfully applied to blanking and piercing operations, Figure 1, for which they would not have been considered seven years ago. The ability of these dies to economically produce burr-free close tolerance work with minimum maintenance has led to these broadened applications.

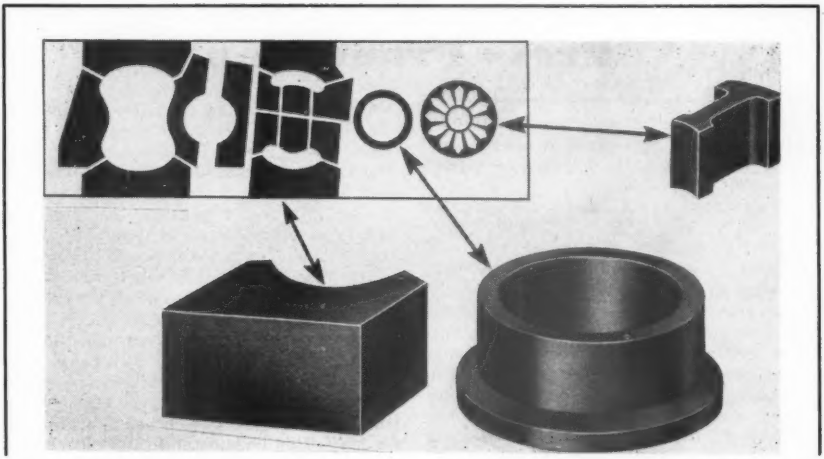
Sheet metal designers and process engineers should consider carbide die applications when production requirements for individual pieces run into several millions. Large production runs are necessary because carbide dies usually cost from 2½ to 3 times as much as steel dies, and thus must produce a sufficient number of pieces to justify the added cost. Of course, carbide dies outlast steel dies by 8 or 10 times so production of millions of pieces with one die is easily accomplished.

Where burr-free close tolerance parts are specified carbide dies offer an excellent solution. Long life of carbide dies between sharpenings is another cost consideration in favor of their application.

A design detail that has led to wider applications of carbides to blanking and piercing operations is the ability to build sectional dies for complicated shapes, such as indicated in Figure 2. These die nibs

Fig. 1. Representative parts now being produced on tungsten carbide blanking and piercing dies.





can be furnished by the carbide manufacturer in virtually any rough formed shape with grinding stock left for finishing. There are many qualified manufacturers of steel dies who are now in the position to furnish carbide dies.

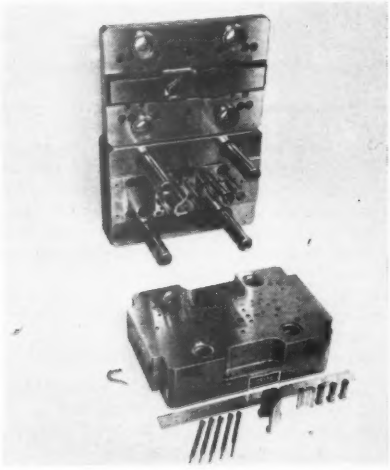
Several interesting carbide blanking and piercing dies have been designed and built recently by Oberg Manufacturing Company of Tarentum, Pennsylvania. The

(Continued on page 144)

Fig. 2. (above) Rough formed carbide die nibs can be utilized to build up sectional dies of complicated shapes.

Fig. 3. (below, left) A carbide die that produces two grid plates at a time. Note the thin sections required in the carbide punch.

Fig. 4. (below, right) This progressive blanking and piercing die produces the cradle at the left (see also Figure 1) with two holes as small as 0.072″ diam. In front are interchangeable carbide punches and bushings supplied as spares.



Band Machines Short Cut Die and Press Production

Per unit cost of stampings, regardless of quantity involved, can always be held to a reasonable figure by proper planning.

In all progressive tool rooms the band machining method in connection with blanking die production is always given prime consideration, because in no other way can material waste be minimized while getting the most from die makers at the lowest operating cost possible. With the shortage of die and tool steels becoming more and more acute, basic machine tools over-loaded and labor costs surely to go up and up, every measure of economy must necessarily be taken to get the most from the least.

Metal stampings are now produced by three distinct methods, namely; the conventional press die; the Continental process die utilizing a floating punch; stack contour sawing. Not so many years ago, the point of volume at which a line could be drawn in favor of one method over another was a problem; this was particularly true when short runs were really "short" because the effects of die cost on per unit cost were indeed discouraging. Fortunately, per unit cost of stampings need not to-day be excessive or even abnormal and band machining techniques are in most part responsible for this economy. The application of the proper procedure to proper volume is all that counts, however, it required extensive research and field work to arrive at definite conclusions.

by **H. J. Chamberland**
Research Engineer
THE DoALL COMPANY
Des Plaines, Illinois

The conventional die needs no introduction because it is as old as the punch press. The Continental die is a thin shuttle-actuated die made of tool steel considerably less expensive than the production die, even low carbon or cold rolled are often used. When contour sawed, the blanks are pressed into stacks to be cut simultaneously; in this case cutting time is the only factor because tool cost per unit is as insignificant as that of the conventional die with mass production. That the production die is highly efficient but not necessarily limited to mass production, this we already know. Wherefore, the question arises as to when should the Continental die process supersede the production die and likewise stack contour sawing replace the thin die. Let us first consider how the cost of the production die may often be substantially reduced and thus applied profitably to considerably shorter runs of stampings than if the die were contour sawed conventionally.

Die Slug is Utilized for Punch

The technique whereby both punch and die can be contour machined from the same piece of steel, thus utilizing the die slug for the punch, is often unjustly ignored. It is true there are many dies requiring a closer precision than that possible by contour machining; the fact remains that even such dies can be contour sawed to a stage of completion where con-

(Continued on page 166)

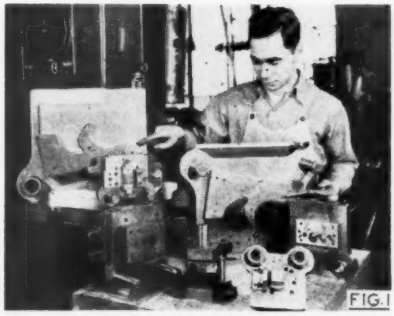


Fig. 1. One of the major advantages of the band machining process is material economy, regardless of the application involved, die production does however benefit the most.

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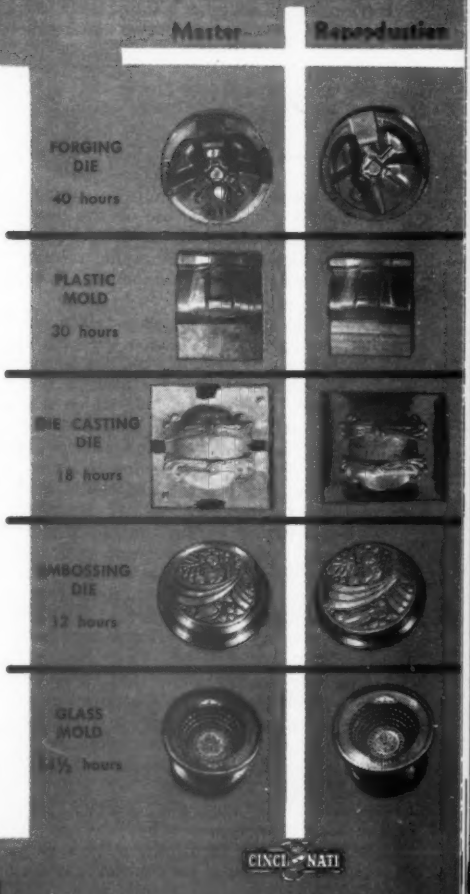

Do you make dies and molds like those illustrated here? All are examples of the low-cost work performed by CINCINNATI 8" x 18" Tool and Die Milling Machines. Note the perfect likeness of the reproduction to the master; *they were not hand finished prior to photographing, nor were the photos retouched.* Features of the 8" x 18" which are responsible for the excellence and low cost of this type of work include sensitive, light pressure automatic depth tracing unit . . . double swivel adjustment for spindle head . . . full 8" x 18" cutting area in one setting . . . antifriction feed screws and nuts. Complete data may be obtained by writing for a copy of our new catalog No. M-1731.

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Tooling the Press Brake for Refrigerator Cabinets

Press brakes are used for many operations in most refrigerator plants in this country, where they have proven a reliable and versatile tool. However, the real versatility of the press brake is displayed to a much greater degree when applied to limited production refrigerator plants such as have recently been planned and established in a number of foreign locations.

Here the press brake may be the only press used in the production of metal

by **T. Robert Innis**
Die Engineer
THE CINCINNATI SHAPER CO.

stampings used in the refrigerator cabinet. Even the doors can be made on the press brake, although the long stroke required for the deep-drawn outer stamping usually eliminates this drawn component from press brake production.

In one such plant recently put into operation, one press brake was indeed the only press used to produce all the larger stampings used in the refrigerator cabinet with the exception of the door which was imported from the U.S.A. as an unfinished stamping. The many smaller stampings required were also to be imported until additional smaller presses and their tooling could be set up.

The basic requirements for the all-purpose press brake for this plant included pressure capacity of 250 tons, bed and ram surface dimensions 36″ x 192″, clear space between housings 150″, stroke of 5″, and shut height of 14″. This machine is illustrated in Figure 1.

To provide the greatest flexibility for die arrangements, removable bolster plates and heavy support angles were provided for the ram of the machine. The front surface of the bed was also a heavy removable angle to provide for possible future use of forming and piercing dies of the hang-over type.

Special features required for this particular tooling included air counterbalances for the ram to offset the weight of heavy dies. Removable rubber cylinders were intalled under the bed to provide for draw pressure, and also an air operated clutch with electric control.

Two movable electric palm buttons at each operator station provided safe control of the press by requiring all operators to remove both hands from the die area to his palm buttons before the press stroke could be made. These palm buttons were connected to plug-type outlets by rubber covered wire and supported and clamped in a slot along the edge of the front bed angle as shown in Figure 1. This allowed each palm button to be located most conveniently for the operator. Palm buttons not being used for a particular operation could be removed and replaced by special plugs, thereby retaining control in the remaining buttons.

The electric control of the clutch was so arranged that during the down stroke of the press brake, release of any palm button would disengage the clutch and stop

(Continued on page 186)

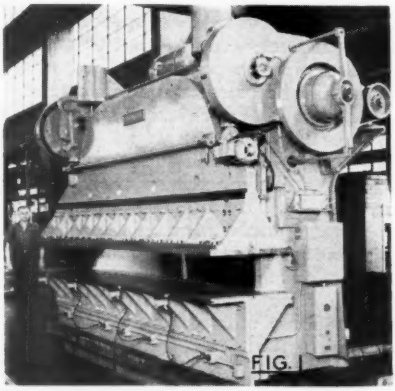

Fig. 1. Press brake for producing refrigerator cabinet components, showing removable wide bolsters and heavy angles on ram and front of bed. Palm buttons for controlling the air actuated clutch are shown mounted in the slot along the front edge of the bed angle.

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NEW DOUBLE PURPOSE PRESS

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Gives the full story of the DI-ACRO Punch, and also DI-ACRO Benders, Brakes, Shears, Rod Parters, Notchers, as well as the new DI-ACRO Vari-O-Speed Powershear and Hydra-Power Bender.

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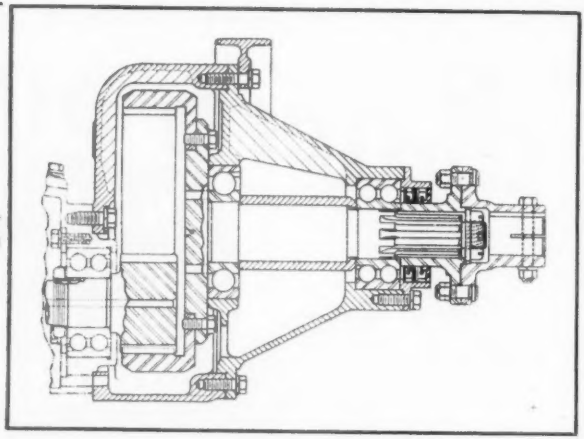
NOTCHERS PUNCHES BENDERS BRAKES ROLLERS SHEARS ROD PARTERS

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

This sectional drawing shows a typical reduction gear. The drive gear is standardized, and a suitable ring gear is used for each ratio.



Precise Machining Produces Quiet Gears

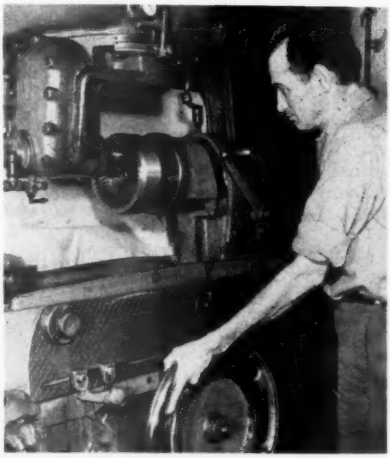
by **E. C. Freeman**
Supt. of Mfg.
Marine and Industrial Engine Div.
CHRYSLER CORPORATION

Quietness, freedom from vibration, and durability are major requirements of gearing for marine engine applications. This applies particularly to the reduction gear set, although at Chrysler the timing gear train demands the same meticulous care to assure freedom from noise in the powerplant assembly.

As shown in the sectional view, the reduction gear assembly consists essentially of a large drive pinion which is integral with the drive shaft; and a large diameter internal ring gear. These gears are of helical type. Because of the variety of gear ratios demanded by marine engineers, the internal type of gear set lends itself admirably to these requirements, the best answer being found in standardizing upon one drive gear, and by supplying suitable ring gears for each ratio.

It may be mentioned at this point that the perfection of mating gears, durability, and the elimination of noise are the results of precise quality control coupled with the technique of rotary cutter gear shaving, using the familiar National Broach Red Ring equipment adopted by this division many years ago. However, in addition to the usual gear shaving procedure—on the internal ring gear and on the timing gears—the Red Ring Elliptoid crown shaving

(Continued on page 146)



Close-up of work station of Red Ring gear finisher set up for crown-shaving reduction drive pinions. The machine guard has been removed to show this detail.

Acknowledgment: from "Automotive Industries", April 1, 1952; and our thanks to Editor James R. Custer for permission to reprint. E.W.P.

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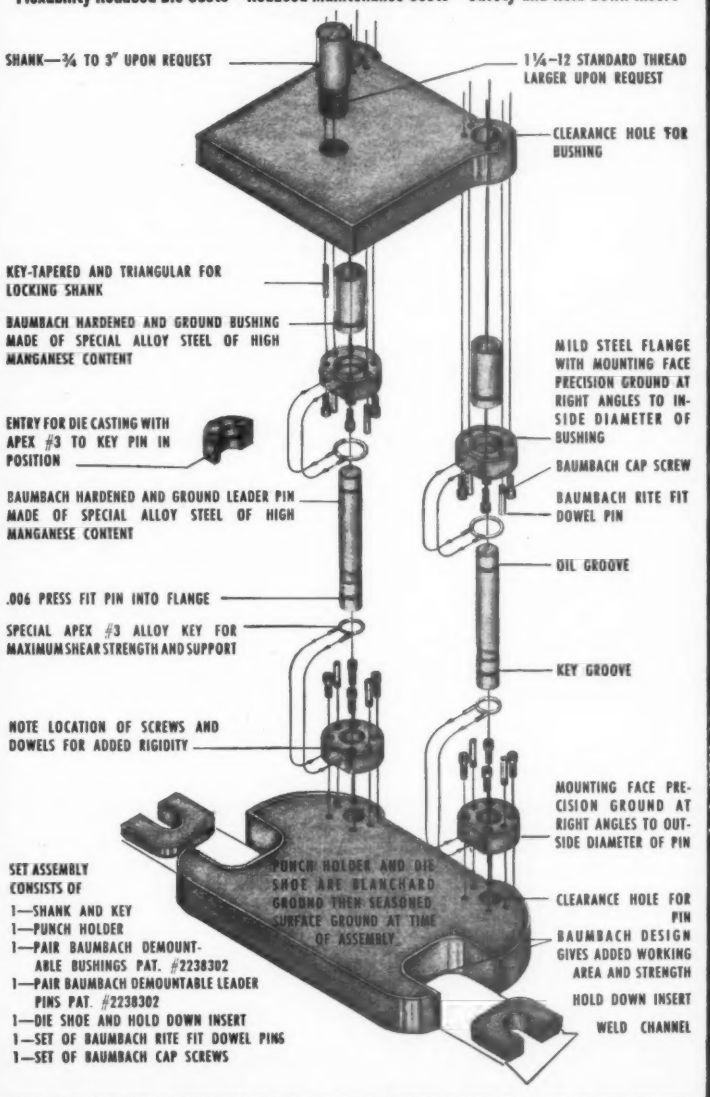
Accuracy and Alignment
Flexability Reduced Die Costs—Reduced Maintenance Costs—Safety and Hold Down Insert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1¼–12 STANDARD THREAD LARGER UPON REQUEST
CLEARANCE HOLE FOR BUSHING
KEY-TAPERED AND TRIANGULAR FOR LOCKING SHANK
BAUMBACH HARDENED AND GROUND BUSHING MADE OF SPECIAL ALLOY STEEL OF HIGH MANGANESE CONTENT
MILD STEEL FLANGE WITH MOUNTING FACE PRECISION GROUND AT RIGHT ANGLES TO INSIDE DIAMETER OF BUSHING
ENTRY FOR DIE CASTING WITH APEX #3 TO KEY PIN IN POSITION
BAUMBACH CAP SCREW
BAUMBACH RITE FIT DOWEL PIN
BAUMBACH HARDENED AND GROUND LEADER PIN MADE OF SPECIAL ALLOY STEEL OF HIGH MANGANESE CONTENT
OIL GROOVE
.006 PRESS FIT PIN INTO FLANGE
SPECIAL APEX #3 ALLOY KEY FOR MAXIMUM SHEAR STRENGTH AND SUPPORT
KEY GROOVE
NOTE LOCATION OF SCREWS AND DOWELS FOR ADDED RIGIDITY
MOUNTING FACE PRECISION GROUND AT RIGHT ANGLES TO OUTSIDE DIAMETER OF PIN
PUNCH HOLDER AND DIE SHOE ARE BLANCHARD GROUND THEN SEASONED SURFACE GROUND AT TIME OF ASSEMBLY
CLEARANCE HOLE FOR PIN
BAUMBACH DESIGN GIVES ADDED WORKING AREA AND STRENGTH
HOLD DOWN INSERT
WELD CHANNEL
SET ASSEMBLY CONSISTS OF
1—SHANK AND KEY
1—PUNCH HOLDER
1—PAIR BAUMBACH DEMOUNTABLE BUSHINGS PAT. #2238302
1—PAIR BAUMBACH DEMOUNTABLE LEADER PINS PAT. #2238302
1—DIE SHOE AND HOLD DOWN INSERT
1—SET OF BAUMBACH RITE FIT DOWEL PINS
1—SET OF BAUMBACH CAP SCREWS

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Cold Forming of the Stainless Steels

Introduction

The usual types of press operations such as blanking, punching, perforating, bending and stamping can be performed on all types of stainless steels; the degree of success varying with both the grade and the type analysis within the grade. Thus, the martensitic or hardenable grades of stainless that have a high carbon content are formed with difficulty unless they are in the annealed condition. In the lower carbon grades within this group, such as type 410, greater cold deformation can be experienced when the material is in the annealed condition, even in the hardened and tempered condition, type 410 can be formed to a limited extent. Both the ferritic and the austenitic stainless compositions have greater fabricating properties; these materials, in addition to the usual press operations, can be drawn and spun into complicated shapes. Of the two groups, the austenitic alloys are the more formable, Thus, a comparison utilizing the Olsen Cup Test, the values received on 0.035 inch stock indicate that the austenitic alloy, type 302, has a value of approximately 0.440 inches as compared to a ferritic alloy, type 430, which has a value of approximately 0.330 inches. These figures can be compared also to that received on a low carbon deep drawing stock which has a value of approximately 0.370 inches.

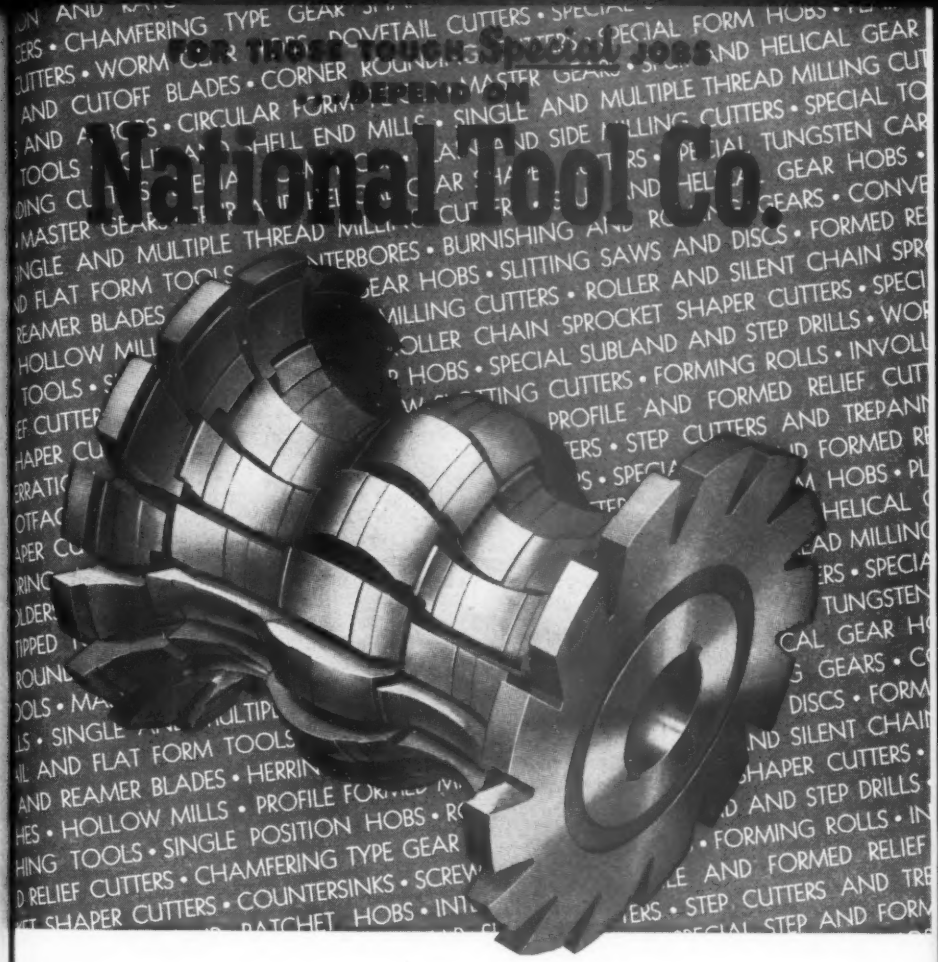
by **Lester F. Spencer**, Ch. Met.
LANDERS, FRARY & CLARK,
New Britain, Conn.

Within the austenitic group, a variation of cold forming ability exists; this being dependent upon the ratio of chromium and nickel within the specific composition. Thus, type 301 stainless has a high cold working rate and is confined to moderate forming and drawing operations. It is known throughout the industry as a high strength alloy and as such is used primarily for structural parts. On its drawing properties Krivobok and Sachs [1] have the following to say:- "If, in the annealed condition, it is to be used for deep drawing operations requiring several steps, type 301 will probably form as well as the other austenitic stainless alloys in the first operation; however, in successive forming operations it may present difficulty which necessitates annealing. Because of its higher strength, this type alloy is more likely to wrinkle than the other austenitic types. In addition to the normal rupturing due to the exhausted ductility, this alloy is likely to develop a tendency to stress at considerably lower reductions than do the higher nickel types. This stress cracking becomes excessive when the nickel content is reduced to below 7.0 percent; thus, parts drawn or spun from such material are prone to stress crack before there is time to provide a stress relieving or annealing treatment."

The more common composition that is employed in deep drawing or spinning is type 302, commonly referred to as '18-8'. Due to its lower rate of work hardening than that experienced with type 301, considerable reduction,usually up to 45 to 50 percent, can be performed from the annealed sheet before a regenerative annealing treatment is necessary. Type 304 stainless has similar working properties as that exhibited by type 302; the major differences being the maximum carbon of 0.08 percent within the composition. This lower carbon content will limit the amount of intergranular carbides to form when within the sensitizing range (800 to 1500 deg. Fahr.), and, in some applications, can be welded with the complete welded structure being placed in service without benefit of a corrective anneal.

Stainless type 305 has a lower rate of work hardening than any of the pervious austenitic grades mentioned; it reputedly being an ideal analysis for spinning operations. Personal experience has revealed that this composition can have reductions as high as 72 percent; this fact resulting in considerable savings due to the elimination of operations. Thus, on three specific examples the following savings were obtained:- (1) reduction on a unit part utilizing 302 stainless realized a 47 percent reduction as compared to a 68 percent reduction utilizing type 305. In spite of the

(Continued on page 84)



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Carbide Segregation as Related to Tool and Die Life

Carbide segregation has a marked deleterious effect on the physical properties of high alloy tool steels, such as all high speed steels, and the high carbon-high chromium die steels. For a long time this fact has been known by both the steel manufacturers and tool makers; however, little information has been published on the relative magnitude of this effect.

by **Stewart G. Fletcher**
Chief Metallurgist
and
David Hughes
Metallurgist
LATROBE STEEL COMPANY

The influence of carbide segregation is not confined to physical properties alone; it reflects itself in production life of tools and dies as well. Reports received from a large number of tool and die manufacturers consistently point out the improved production records of tools free from carbide segregation. One large steel products fabricator stated that on a difficult punch and die application involving the use of 1.50% carbon, 12% chromium air hardening steel, production with conventional steels average 300,000 pieces per grind with a considerable amount of chipping and breakage encountered. Production with segregate free steel of the same chemical analysis and on the same operation averaged 1,600,000 pieces per grind without any chipping and very infrequent breakage.

There are two general types of carbide segregation; microsegregation and macrosegregation. Microsegregation refers to the carbide concentration gradient across a group of a few grains or crystals of metal, while macrosegregation refers to the gradient across the entire mass involved, e.g., the cross section of the bar. The latter is the type of segregation to be discussed in this article.

Carbide segregation occurs initially during the freezing of the molten steel in the ingot. While in the liquid state, the metal is a homogeneous molten mass consisting of the various alloying elements dissolved in the iron. Immediately upon casting however, selective freezing begins so that the first crystals to solidify are those which have the composition corresponding to the highest freezing temperature. As solidification continues, the liquid with an altered composition and lower freezing point gravitates toward the center of the ingot, which is the last portion to freeze. It is here in ingot center that the alloy carbide particles are forced to solidify and it is here that segregation is most severe. True, subsequent hot working of the ingot diffuses and breaks up the segregate to a limited extent, but unless considerable upsetting is employed, traces of segregation persist even though the steel is worked down into small sizes. Because segregation is a natural process,

(Continued on page 86)

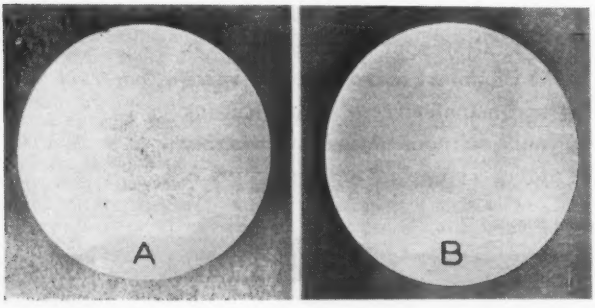

Fig. 1. "A". Heavy carbide segregation in 3" round specimen, type M-2, high speed steel, revealed by hot acid etch test.

"B". Non-segregated sample of 3" round specimen, type M-2, high speed steel, determined by hot acid etch test.

A new small hole grinder

Flexibility keynotes this new Rivett Model 84. Primarily a small hole grinder, it may be equipped for external grinding. Simplicity reduces set-up time on the variety of work normal to the tool-room and die shop. Collets and step chucks quickly mount single or repetitive pieces.

The new Rivett 84 grinds holes from the smallest up to 3″ diameter, with a maximum 4″ depth depending upon diameter; external work to 3″ diameter by 4″ length.

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★ Workhead Spindle mounts draw-in collets and step chucks directly.

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The Master Craftsman's Master Tools

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

. . . Cold Forming, from page 80

Table I

Chemical Composition Per Cent						Rate of Forming Characteristics
Carbon	Nickel	Chromium	Manganese	Columbium	Titanium	
0.040	8.50	18.40	0.52	—	0.40	Extremely poor
0.060	10.20	17.60	0.64	—	0.48	Good
0.045	8.40	17.10	0.55	0.72	—	Extremely poor
0.050	9.80	17.50	0.60	0.87	—	Relatively poor
0.060	11.00	18.50	1.36	0.74	—	Good
0.050	12.40	18.40	1.26	0.88	—	Excellent

Courtesy:—Ryan Aircraft Co. reported by ref.(1)

additional cost of material, a savings of $0.896 per hundred units was realized; (2) On another part utilizing stainless 302, a reduction of 56 percent was realized before a regenerative anneal was required. This can be compared to a reduction of 72 percent with type 305; the savings realized above extra material costs was $1.61 per hundred; and, (3) On another part utilizing stainless steel, type 305, the entire part was made with no annealing and a cost savings of $2.80 per hundred was realized. There is no question that 305 can be used in many instances involving deep drawing to advantage; the savings realized usually being from such operations as washing, pickling and annealing eliminations.

The stabilized grades, types 321 and 347 have less favorable forming characteristics than the previous austenitic alloys discussed, however this fact is accepted in certain endeavors such as the aircraft industry where the necessity of complete freedom from intergranular carbides within a welded part is a pre-requisite. This is also true on material which of necessity must be operated within the carbide precipitation zone of 800 to 1500 deg. Fahr. Of interest is the austenitic alloy, which is very new and made commercially to a limited extent, which has a limiting carbon of 0.03 percent. Performance indicates that during welding no harmful carbides will form at the grain boundries, and in many instances, it will perform the same function as the stabilizing grades. This type of material has been recommended for applications that involves short heating periods within the sensitization range.

In an investigation conducted by the Ryan Aircraft Co. on the relationship between work hardening rate to the variation in both chromium and nickel within the stabilized compositions, it had been determined that an increase of the nickel content within the base composition markedly improved the forming characteristics of these alloys. The change in base composition versus the rating given in regard to the forming characteristics is given in Table I.

The austenitic chromium-nickel steels rapidly attain high mechanical strength when subject to cold working; the degree of cold working of sheet and strip being controlled so as to obtain specific tempers. Thus, there are five tempers available, namely the annealed condition, one-quarter hard, one-half hard, three-quarters hard and full hard; the strength increasing progressively within the alloy accompanied by a loss of ductility. Thus, the various tempers have their further formability diminished but not exhausted; the degree of formability remaining being dependent not only on the specific temper chosen, but also, to a large extent, by a proper choice in the forming procedure to produce a specific item. Where the additional stiffness of a temper is required in a formed part, specific data and recommendations as to both choice of temper and method of forming can be obtained by consultation with the producers of stainless steel.

One specific phenomenon which occurs usually with the austenitic stainless compositions, especially in press formed parts, is that of stress cracking. This occurs in areas which have particularly high stress concentrations such as that experienced in sharp corners, under the flange of angular parts, or areas of reduced cross section. In instances where stress cracking has occurred on straight sided circular drawn shells, the usual cause was that too great a reduction had been made prior to the first annealing treatment. Where reductions are very close in this border-line condition, it is usually imperative to quickly follow through on an operation of wash

(Continued on page 92)

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SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

. . . Carbide Segregation, from page 82

both manufacturers and consumers of high alloy steels heretofore have agreed that some segregation is to be expected in all tool steels, however deleterious it might be. Relatively recent improvements in manufacturing techniques have altered the standards for carbide segregation until today there is no longer any necessity for the use of high alloy tool steel containing excessive carbide segregation.

There are two generally accepted tests for determining the degree of segregation present in high alloy tool steels: the hot acid etch test and the harden, polish and etch test. The former consists of selectively etching a representative sample in a hot acid solution and interpreting the etching pattern produced on the sample. Figure 1 is an illustration of two such hot acid etched discs; one showing a considerable degree of segregation and the other exhibiting but little.

Inasmuch as the acid attacks constituents other than the segregation alloy carbides, thus affecting the overall pattern produced, the harden, polish, and etch test was developed to show more selectively the degree of segregation. Briefly, this test consists of hardening and tempering a representative sample of the steel, polishing until a mirror finish is obtained, then etching in a 5% nitric acid alcohol solution for several minutes, which darkens the matrix and leaves the carbides unaffected by the etchant. Segregation can readily be seen with the unaided eye. Figure 2 shows discs of segregated and non-segregated steel prepared for examination by this method. An additional advantage of using this technique is that the treated test sample shows exactly the conditions to be expected in the finished, hardened tools rather than the annealed condition as revealed by the hot acid etch test.

Before the introduction of its "DESEGATIZED" tool steels to the market several years ago, the Latrobe Steel Company set out to study the effect of carbide segregation on the properties of alloy steels. Numerous laboratory tests as well as field tests were conducted to study such factors as toughness, dimensional stability, machinability, and reaction to heat treatment of both segregated and non-segregated ("DESEGATIZED") high speed and high carbon-high chromium steels.

A commonly used test to measure the toughness of steels is the impact test. Although impact tests are not the entire answer to the problem of toughness, they do measure a definite factor related to resistance to shock and in this way give an indication of dynamic toughness. In this study, the unnotched Izod impact test was used exclusively and the procedures followed those given by A.S.T.M Specification E23-47T.

In a series of closely controlled tests, it was possible to show clearly the effect of segregation on the impact strengths of T-1 and M-2 high speed steels. These data are presented in Table I for T-1 and Table II for M-2 steel.

Similar tests conducted on other types of commonly produced high speed steel analyses and high carbon-high chromium die steel analyses exhibited impact strengths 20% to 40% higher for non-segregated material as compared to heavily segregated material.

In order further to confirm this effect,

(Continued on page 118)

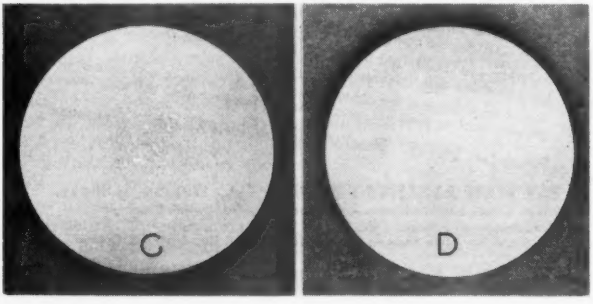

Fig. 2. "C". Heavy carbide segregation in 3" round specimen, type M-2, high speed steel, revealed by the harden, polish, and etch test.
"D". Non-segregated sample of 3" round specimen, type M-2, high speed steel revealed by harden, polish, and etch test.

UNBALANCED LOADS are no problem on this CLEVELAND

The Single Crank Double-Action Cleveland Toggle Press shown in operation here was recently purchased by a leading automotive manufacturer. A glance at the formed piece, shown in the insert, will tell you that the load is severely unbalanced during this forming operation; therefore, complete slide accuracy must be maintained to avoid rejects and costly delays.

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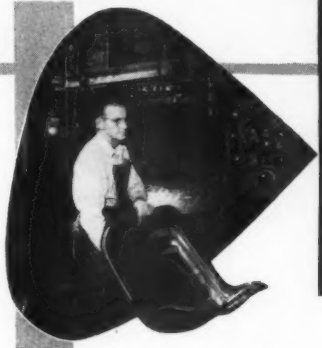

STROKE: Slide 26", Blankholder 18"
FACE OF: Slide 40"x 42", Blankholder 56"x 53"
CAPACITY: Slide 600 tons, Blankholder 400 tons
Strokes per Minute—7

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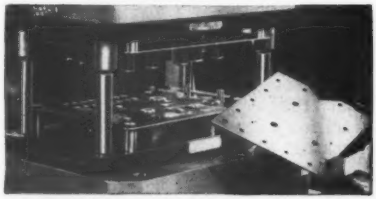
All units and parts are interchangeable and used repeatedly in different arrangements. **INCREASE PRESS PRODUCTION** – Down time is minutes as compared to hours for changeover. For precision work in all types and sizes of presses. **START PRODUCTION at once.** Pierce up to ¼" thick mild steel. Saving money in the best known plants.

Whistler *MAGNETIC* Dies at work in large inclinable press. Magnetized units hold the retainers. No bolting required. A fast, economical method in making up a punch and die set for short or long runs. All parts re-usable.



Whistler *ADJUSTABLE* Dies on ⅛" steel perforating and notching job, using Tee slotted die set. With Whistler Punch and Die units production starts within hours instead of weeks. Last minute job changes made quickly.

Here are the complete details with prices and application illustrations. Send for these catalogs. No obligation.

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S. B. WHISTLER & SONS, Inc.

Adjustable, Magnetic, Custom and Cam Dies for all Industry

748 Military Road **Buffalo 23, New York**

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

. . . Cold Forming, from page 84

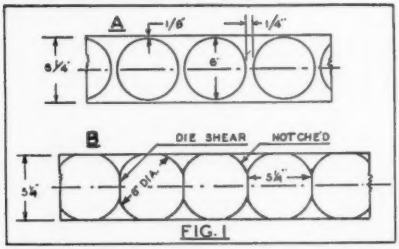


Fig. 1. Comparison of two methods for producing circular blanks (1)
Material requirements for blanks.
A. Finished blanks
6¼" x 6¼" = 39 sq. in.
B. Notched and die sheared blanks
5¼" x 5¼" = 27.6 sq. in.

and anneal in order to relieve the stress concentrations. In the event that the ferritic types of stainless steel are formed, stress cracking may also occur; this usually being alleviated by an anneal between 1000 and 1150 deg. Fahr. Cracking which occurs during annealing is usually termed 'fire-cracking' and is due to the superimposed thermal stress on the stress within the item. In many instances, this type of failure can be counteracted by a pre-heat of 600 to 800 deg. Fahr. prior to actual full annealing of the article.

Since defense requirements are now absorbing nearly all of the current production of nickel, industry has to consider the use of a substitute straight chormium stainless steel such as type 430 for many products that formerly were made from the austenitic type 302 stainless. Besides the standard 430 analysis as given, a modification termed 430T is available; this specific analysis being stabilized with 0.30 to 0.70 percent titanium and being recommended for applications which will involve welding. The purpose of the titanium addition is to control grain growth during welding; the fusion welding with an inert gas shield being usually recommended. A filler rod of either types 302 or 310 are generally used in order to obtain a more ductile weld.

As mentioned previously, the ductility of type 430 stainless and its modification is approximately 50 percent of that exhibited by the chormium-nickel steels. Provisions must be made for higher holddown pressures, increased radii and less reduction per operation where type 430 stainless is used as a substitute for type 302. In addition, the type 430 steels do not stretch form as readily as the more ductile type 302. The chromium steels have a tendency to directional properties, and are more sensitive to breaking in longitudinal lock seaming and bending operations. They may also exhibit stretcher strains when dead soft, annealed stock is drawn. This latter difficulty may be controlled to some extent by light temper rolling. These steels are not subject to age hardening. Type 430 steels do not work harden as severely as does type 302 and, as a result, are not as susceptible to stress cracking after drawing.

Press Working Operations

For the purpose of clarification, press working operations can be conveniently grouped into four general divisions: these divisions being indentified by a specific type of working action. Thus, these groups are: (1) Those operations which involve a shearing action such as is experienced in either blanking, punching, perforating, trimming, etc.; (2) Those operations which involve a bending action such as is experienced in operations such as curling, expanding, bulging, bending and beading; (3) Those operations which causes metal to flow plastically from one form to another under a tensile loading such as is experienced in deep drawing practice; and, (4) Those operations where a squeezing action takes place and compressive stresses are introduced, this being exemplified by operations such as coining, swaging, sizing and cold heading.

Group I

Shearing can be defined as "A type of cutting operation in which the metal object is cut by means of a moving blade and a fixed edge or by a pair of moving blades that may be either flat or curved". The factors that are important in shear operations are tool material, condition of tools, and both condition and power of equipment that is to perform this shear operation. Thus, it is quite important to rely on a good quality steel as tool material; usually the standard high carbon-high chromium composition and the 18-4-1 high speed analysis being approved.

(Continued on page 104)

CINCINNATI

It will change your thinking on deep drawing and forming!

NEW CINCINNATI

Hydroform

A REVOLUTIONARY NEW PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

Here is an entirely new metal-forming machine utilizing a new deep drawing principle.

Practically any shape can be formed from a wide variety of materials up to 3/8" thick.

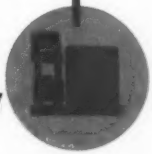
Hydroforming produces deep drawn parts in fewer operations.

Only simple, inexpensive tooling is required.

Part quality is improved. Surface finish is unimpaired.

FULL DETAILS NOW AVAILABLE

New Hydroform Bulletin No. M-1759 is now available. It gives a complete description of the Hydroform process; illustrates a variety of Hydroformed parts, and gives detailed machine specifications. Your free copy will be mailed promptly on request.



MACHINERY DIVISION

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

Rocket Motor Bodies Cold-Formed In Six Stages

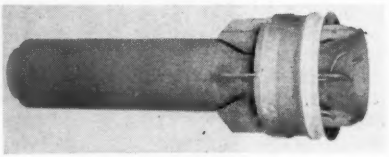
The active life of a 3.5-inch bazooka rocket is something less than two seconds of concentrated inferno on the wing. Its destructive powers are known to those who saw what it did to Chinese Communist tanks.

To protect the crews who launch the rocket, and to be sure the weapon's pent-up fury is controlled and directed where it's wanted, every precaution must be taken in its manufacture.

by **H. W. Chapman**
Assistant Chief Engineer
EVANS PRODUCTS COMPANY
Plymouth, Michigan

When assembled and ready for use, the rocket consists of war head, motor body and tail fin assembly. It is about 18 inches long. Not all of the weight is concentrated in the bulbous war head. The motor body, which contains the propellant that speeds the projectile toward its target, is necessarily strong to assure against ruptures during launching.

One important contribution to the rocket production program has been made by the Evans Products Company, Plymouth, Michigan. Of the several companies now producing rocket motor bodies, Evans was the first to cold-form the venturi end of the motor body which is a heavy tube about eight inches long, with a sharply tapered venturi or exhaust port in one end.



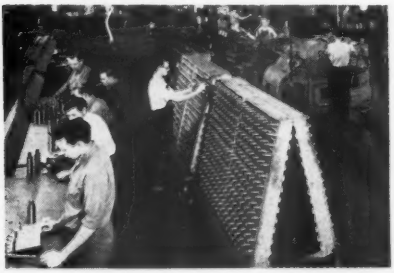
The 3.5" bazooka rocket motor body with aluminum tail fin assembly.

Evans engineers, no strangers to the exacting requirements of military specifications, were confident from the beginning that the venturi as well as the trap seat (a sharply tapered shoulder within the body) could be cold-formed. It is of interest to know that the cold-forming operation, used first by Evans in rocket motor body production, has been adapted by several other suppliers.

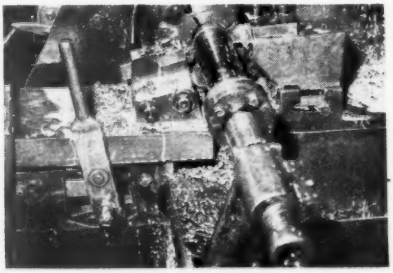
In their early experiments, Evans engineers successfully produced cold-formed rocket bodies from commercial AISI-8640 tubing with the trap seat (the narrowed shoulder where the tube is sharply reduced in inside diameter) cold-formed to the finish machined dimensions. It was hoped that by thus forming the trap seat all machining after heat treatment could be eliminated. However, fearing that stress concentrations would arise during

(Continued on page 98)

Company and government inspectors impose severe quality specifications on rocket bodies.



Cutting on center, two hss tools cut off tube stock to required length. Tools are ground so as to face one end square with axial centerline. Workpiece drops off as tools continue to cut, facing forward end of next workpiece square with its centerline. Cam actuated stock stop moves out of the way for workpiece to fall clear.



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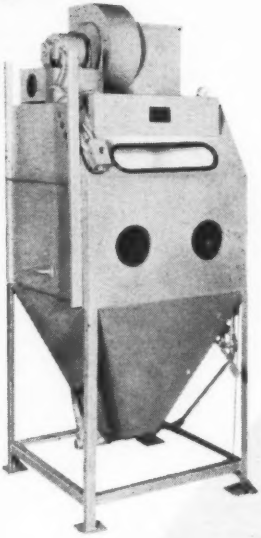
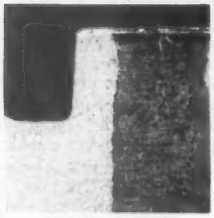
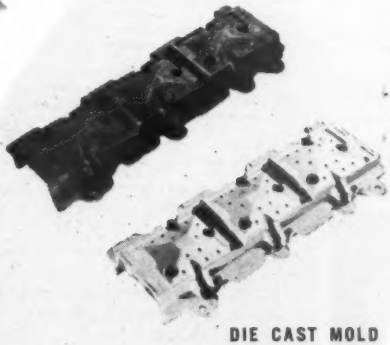


TAP



FORM CUTTING TOOL



DIE CAST MOLD

Abrasive Wet-Blasting is a superior surface finishing method that has become the answer to the demand for efficient, economical burring and honing of cutting tools, taps or dies, cleaning and scaling of molds or heat-treated parts, removal of directional tool marks on machined surfaces—in fact, the answer to ANY finishing, cleaning or surface treatment problem in production and maintenance in ANY industry.

WRITE FOR BULLETIN

ABRASIVE WET-BLAST, INC.

MANUFACTURERS OF WET-BLAST EQUIPMENT

NILES, OHIO

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

"Hydroform" Metal Forming

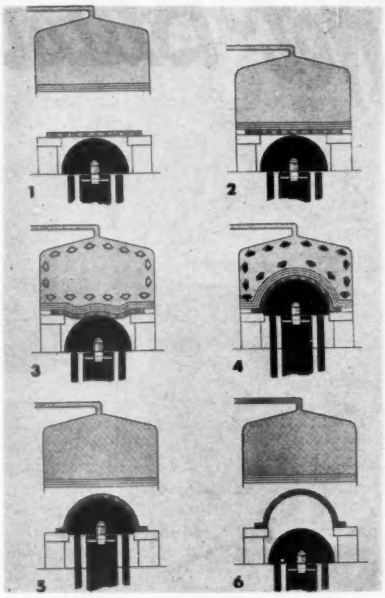
The new line of "Hydroform" metal forming machines, introduced by The Cincinnati Milling Machine Company, are built in 12" and 26" sizes, and can be made in sizes up to 40".

Hydroform machines operate on the principle of a solid punch member moving into a flexible, hydraulically pressurized die member; actually an oil cavity capped with a flexible diaphragm. Sheet metal between these two members is hydraulically formed to the shape of the punch. In operation, the flexible die member is lowered and locked, initial pressure is released, and then the punch member moves upward into the flexible die member. The blank is pressed tightly against the draw ring (surrounding the punch) to control metal flow. As the punch moves up, pressure is automatically increased on the blank being formed, and the metal is subjected to uniform pressure from all sides. Stripping is accomplished automatically as the punch is retracted.

Tools consist of a simple draw ring and a punch made to the shape of the part being formed. Because of the hydraulically controlled forming principle, the surface of the metal being formed is not scuffed or scarred, and little or no abrasive is imposed on the punch.

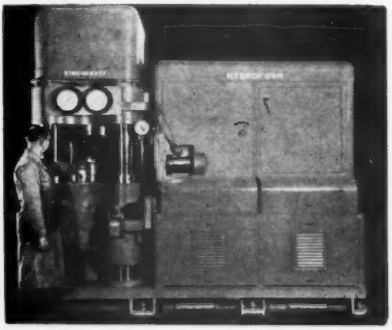
The hydraulic system is equipped with a cooling unit to maintain the proper oil temperature. Electrical push buttons, manual control levers, and setup elements are all grouped conveniently at the operator's working position. Maximum pump pressure developed by the hydraulic system is 8000 p.s.i. although up to 15,000 p.s.i. may be generated in the flexible die member as the punch moves up during the forming process.

To promote safety, the dome is interlocked in its up position while loading and unloading, and in its down position while the work is being formed. A two-position "form speed" control lever regulates the speed of the forming stroke, giving the operator a choice of high or low forming speed to suit the material and size and shape of the part.

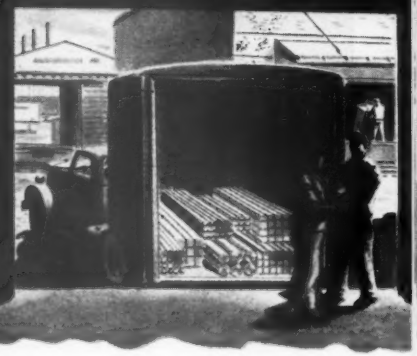


(Above) This schematic drawing shows the operating principle of the Hydroform press and technique. The working cycle is as follows:
(1) Blank is placed on the draw ring;
(2) Flexible die member is lowered and locked into position;
(3) Hydraulic pressure in flexible die member is established to a predetermined setting;
(4) Punch is moved upward into flexible die member;
(5) Flexible die member is raised;
(6) Punch is stripped from finished part.

The main controls are located for both convenience and safety. The operator must use both hands when raising or lowering the flexible die member. Shown below is the 12" Hydroform.



for better die production.



"DESEGATIZED" hi carbon hi chromium DIE STEELS

provide a selection range designed to fit your individual need for die steels:

- Select B—a general purpose air hardening punch and die steel
- Olympic—a very popular non-deforming steel, ideal for intricate cold work applications requiring maximum performance
- Cobalt Chrome—a high carbon—high chromium steel plus cobalt for superior cutting ability
- GSN—an oil hardening die steel for long production runs, subject to severe wear
- BR-4—a high carbon—high chromium die steel with additional alloy content for maximum abrasion resistance.

Production economy demands the best die performance! Select the best steel for the job—one of the "DESEGATIZED" Hi Carbon—Hi Chromium Die Steels!

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Yes! Please send me the booklet, "Selection and Use of Latrobe's "DESEGATIZED" Hi Carbon—High Chromium Die Steels".

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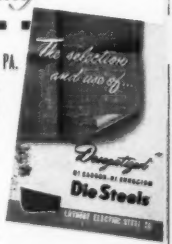

TF-2

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LATROBE, PA.

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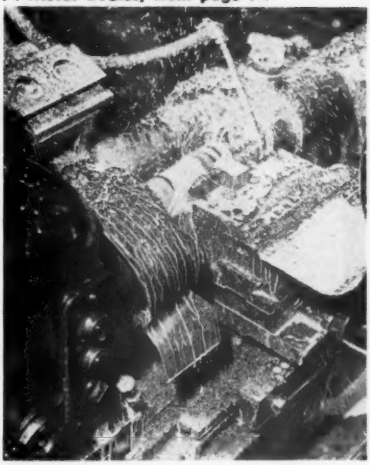
. . . Motor Bodies, from page 94



OD of rocket body is turned concentric with its ID, using two insert type carbide tools.

heat-treat which might result in fractures at the sharp angles of the trap seat, Ordnance engineers insisted that the trap seat be machined after heat-treat.

It was found that no tubing available at the outset of the rocket production program at Evans was being held to close enough tolerances to work successfully in the cold-forming dies. It was decided to machine inside and outside dimensions before forming and after heat-treating to hold the tolerances required of the finished motor body.

There are six steps in the production of these motor bodies at the Evans Products Company. Before the cold-forming operation is undertaken, the triple-alloy tubing stock is cold drawn to 1.646/1.656 in. ID, with a wall thickness of .210 in. plus or minus 10 percent. The tubing is cut to lengths of 7¾ in. and the ID is broached to 1.670/1.672 in.

The OD is then plunge-turned true with the ID on a Fay semi-automatic lathe to 2.012/2.015 in. so that the tube is both round and concentric. Two insert-type tools, with mechanically held cemented carbide square inserts, are used. The motor body is held on a roll-type expanding mandrel that locates on three bearing areas. The mandrel is centered at both ends.

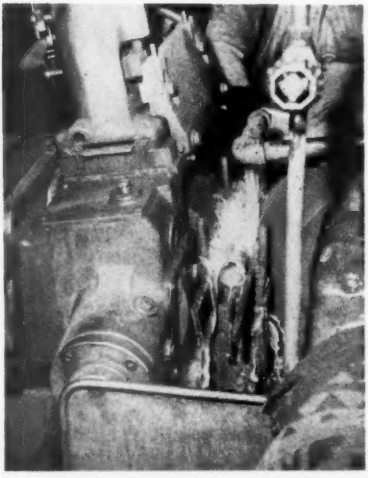
A chamfer is added to one end to facilitate start of the form and to extend die life. After a centerless grind to 2.004/2.006 in. the tube is ready for the first of the six cold-forming operations.

The cold-forming is done on a 290-ton Minster mechanical press, the same used for all Evans' experimental work on the motor bodies. The bottom die sections, mandrel and mandrel backups for the press are made from Latrobe cobalt chrome tool steel. The upper support rings above the bottom die sections are made from Badger oil hardening steel. In order to prevent galling, a high finish is provided on working surfaces of the dies. Profilometer readings are taken at intervals to assure that the smoothness essential to metal flow is maintained.

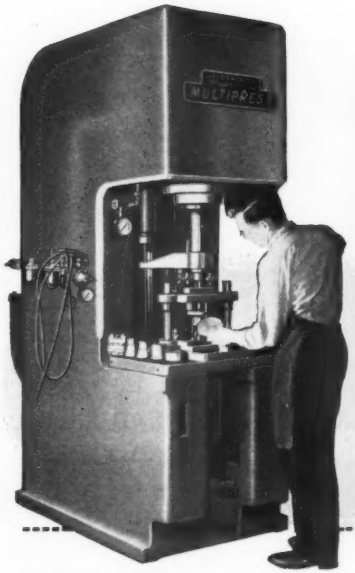
With two operators working the press and feeding tube lengths through the six stages (three on each of two die sets) production is about 190 pcs/hr.

Evans engineers have found that an initial Rockwell hardness of from B85 to B98 is suitable for cold-forming the tube stock over these dies, with no intermediate annealing between stages. The hardness increases from three to seven points on the "B" scale as the tube progresses through the six stages.

(Continued on page 106)



Rocket bodies are precision centerless ground prior to cold-forming operations.



Deep-drawing with

FEWER DRAWS

A 10-DRAW CIVILIAN JOB

CUT TO 3 DRAWS

AN 8-DRAW DEFENSE JOB

CUT TO 4 DRAWS

Towle does BOTH on MULTIPRESS®

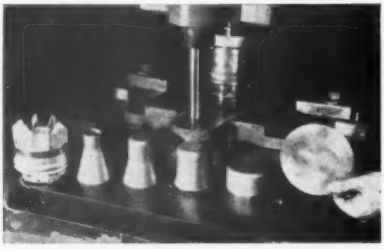
Multipress does it again—this time on deep drawing operations. *In only three draws,* Multipress forms a tube that took ten draws by the old method!

The deep-drawn tubes shown above, which are later formed into five sterling silver napkin rings, are produced on this 35-ton Multipress at the Towle Manufacturing Company of Newburyport, Mass. With three draws a 7¼" flat disc is converted to a 1¾" tube 7" long.

Converted to defense work, the same Multipress forms from a 4⅞" aluminum disc a special tube used in rocket tail-fin assemblies. Instead of the eight draws formerly needed, Multipress does it in four! Dimensions of the tail-fin units must be held to very close tolerances. Production rate is 7200 units per 8-hour day—with negligible scrap losses.

Another Multipress at Towle paid for itself in three months. In still another case, Multipress savings in a single year equalled the cost of the press.

The Multipress combination *of widely adjustable action* and *smooth pressure control* has proved to be the best answer to an amazing range of production jobs, including crimping, staking, assembling, broaching, trimming—and so on. Eight Multipress frame sizes offer capacities from one to 50 tons. Write for full details today!



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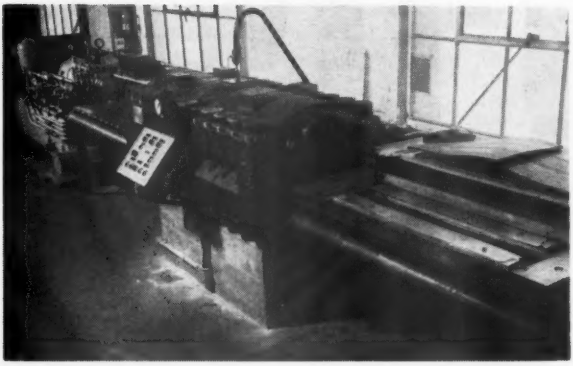
THE DENISON ENGINEERING COMPANY 1197 Dublin Rd., Columbus 16, Ohio

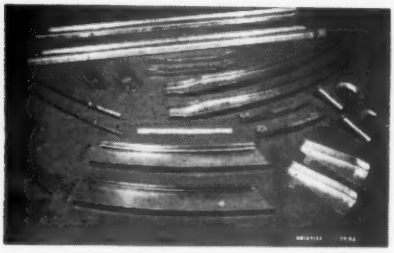
SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

Verson-Wheelon Press Offers Single Die Economy



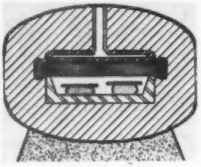
The new Verson - Wheelon direct acting hydraulic press is a new production tool which originated within the aircraft industry but is applicable to many other lines of metal sheet fabrication. At the left is shown the pilot model as installed in the Santa Monica plant of Douglas Aircraft Company where it was developed. The new press is about one-tenth the size of conventional presses yet it is capable of exerting up to three times the pressure currently used in the forming of metal parts used in airplane construction.

(Below) These are typical aircraft parts as formed by rubber-pad hydropresses. Of each pair, one was formed by the conventional Guerin process and the other on the Verson-Wheelon direct acting hydraulic press. Close inspection shows the improved flange detail obtainable on parts formed by the new method. As in the Guerin process, metal forming involves only a single, male die.

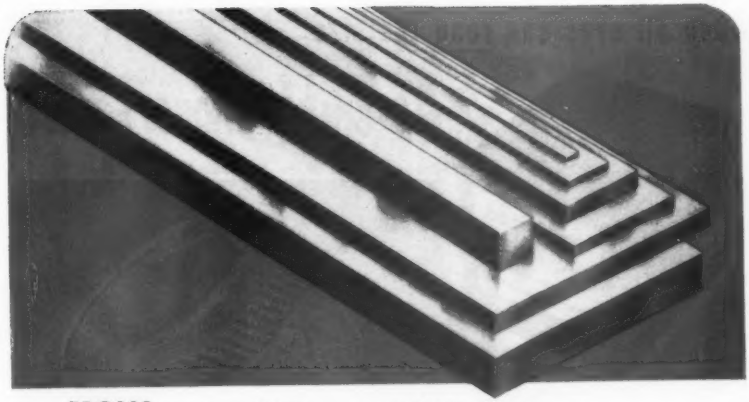


The sheet metal workpieces are placed over simple and inexpensive form-blocks. The high pressure available makes it possible to form the heavier gage metals now employed in modern aircraft. According to Douglas Aircraft, one future application of the new press will be the hot forming of titanium and magnesium, both coming into use in the newer military airplanes.

The Verson - Wheelon method employs a bag or fluid cell which when inflated hydraulically forces the working pad down and around the sheet stock to accomplish the actual forming.



(Above) An example of heavy gage metal forming. From top to bottom: (1) the quarter inch thick 75S aluminum alloy blank; (2) the kirksite form block; (3) and (4) bottom and top views of the formed part. (Below) This close-up of the part shown above illustrates the double break of the flange obtained through the effective side pressure. This reduces the subsequent amount of hand forming.

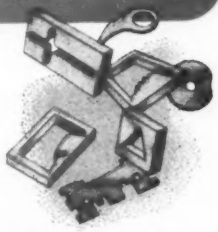


NOW... in addition to Oil-Hardening...

You can also get this

NEW AIR-HARDENING

SIMONDS FLAT GROUND DIE STEEL



For longer-lived punches and dies . . . where greater production runs are needed between sharpenings . . . you can now get this new *Air-Hardening* type of Simonds Ground Die Steel, *which produces up to 50% more pieces per sharpening.*

5% chrome content makes this Air-Hardening Steel more wear-resistant and therefore better suited for punches and dies used on silicon or stainless steels, Monel, or other abrasive metals, and for gages and tools requiring top wear-resistance. What's more, this new *non-deforming* die steel is spheroidize-annealed for good machinability and consistently uniform hardenability. Wide hardening range of 1700 to 1800° F. makes it practically foolproof in heat-treating.

Furnished in many stock sizes in 36" lengths, all sizes are accurately ground to a thickness limit of plus or minus .001" with an extra-smooth surface finish of 25 to 35 micro-inches. Each piece is individually packaged, ready for scribing, shaping and heat-treating. See your Industrial Supply Distributor today.

SIMONDS SAW AND STEEL CO.

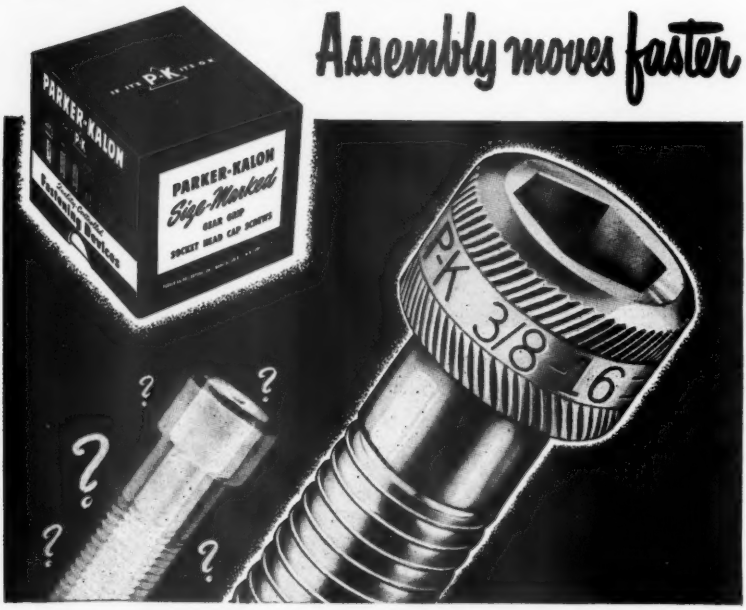
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Ore. Canadian Factory in Montreal, Que.

SEE ADVERTISERS INDEX, PAGE 105, FOR KEY NUMBERS

When all eyes can read the size

Assembly moves faster



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Your INDUSTRIAL SUPPLY DISTRIBUTOR—*your local source for P-K Socket Screws—works side by side with the P-K Assembly Engineer. Their combined efforts are solving many difficult problems of planning and procurement. Let them help you.*

Some sharp-eyed mechanics are expert at estimating the size of a plain head cap screw. But *most* assembly workers, and especially learners, need the screw that puts size beyond question . . . *the P-K Size-Mark Socket Head Cap Screw.*

The size is clearly incised on the head, can be seen at a glance. Saves time and wasted screws when sizes get mixed up, prevents errors and spoiled work. It's a good sales feature, too, because installation and repair work on your product is simpler and easier.

Only P-K offers both Size-Mark and Gear Grip in Socket Head Cap Screws. Ask for samples. See how they save time and trouble all along the line. Parker-Kalon Corporation, 200 Varick Street, New York 14.

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No. 2 PROFILE GRINDER

. . . for grinding Irregular Shapes and difficult Contours

A standard machine tool in die shops and in tool rooms where grinding odd shapes and difficult, irregular contours is necessary.

It is a particularly useful machine for grinding and fitting large dies and punches such as forming dies for refrigerators, table tops, sanitary ware and in automotive and aircraft shops.

Spindles in dual spindle model illustrated, turn at 10,000 RPM; stock removal is rapid even with small diameter wheels. Uses wheels ¼" to 3" in diameter.

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A bench model with spindle speed of 20,000 RPM. Performs in minutes, many jobs that would ordinarily require hours. Uses wheels ⅛" to 1" diameter.

BOYAR-SCHULTZ Corporation

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WRITE FOR LITERATURE FULLY DESCRIBING THESE TIME SAVING MACHINE TOOLS

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

. . . Cold Forming, from page 92

All tools performing a shearing operation should be kept sharp at all times; this being especially true for the austenitic stainless steels.

Where the straight chromium stainless steels are to be sheared, the procedure followed is similar to that experienced with the plain carbon and low alloy steels. There is a cutting action through a greater portion of the thickness of stock after which there is a 'break-through' through the remainder stock thickness. The power required in shearing the straight chromium stainless is considerably in excess of that realized in shearing the plain carbon steels; this being due to the higher shear strengths of these alloys.

Shearing the austenitic stainless steels is different since we have a factor of cold working to consider. The amount of cold working introduced is in direct relation to the sharpness of the cutting blades; thus, a dull shearing blade accompanied by poor clearance will result in a 'bending' action rather than a shear which will introduce cold work and also necessitate much greater power than necessary to complete the cut. Not only is this detrimental to equipment, but also poor life on shear blades will be realized. Therefore, it is necessary to keep shear blades sharp at all times and to closely adjust the clearance factor so as to prevent 'bending' of the edges. A recommended clearance value is from 10 to 15 percent of the thickness of stock to be sheared, however one will find that this value may vary with the conditions. Usually twice the power rating is necessary in the shearing of austenitic stainless than that required to shear carbon steel; there are instances where less than the recommended power rating is used, however this requires careful and exact adjustment of blades and proper maintenance of edge. Of interest is the work by Whitesell* who stated that carbon steel has a shear factor of 50 percent; a low tensile stainless has a shear factor of 39 percent; a medium tensile stainless has a shear factor of 32.0 percent; and, a high tensile stainless has a shear value of 27.0 percent. This is diametrically opposite to what has been previously published.

Blanking operations is one of the more frequent operational procedures within Group I; this operation being quite important since considerable economics can be realized by the proper choice of blanking procedure. The operation may also include trimming dependent upon the method chosen to perform this operation. Thus, square blanks are made on a shear which has two long blades, one being stationary while the other moves vertically; the rotary shear having two rotary disk blades can be used in producing circular blanks; or a method where die components are used with the aid of press equipment. In the latter case, the die member is usually made to size and the clearance employed is taken off the punch. The punch is ground flat and, to reduce the shearing force required to blank the austenitic

*"Tooling for Fabrication of the Stainless Steels', J. C. Whitesell, Steel Processing, Feb. 1947.

(Continued on page 108)

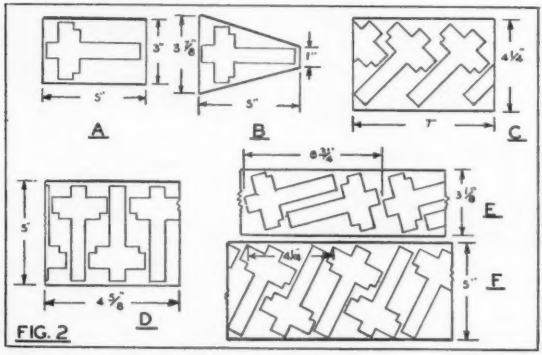


FIG. 2

Fig. 2. Economics in lay-out of "cross" shaped part (5) Calculations — Methods:

A. $3'' \times 5'' = 15$ sq. in.

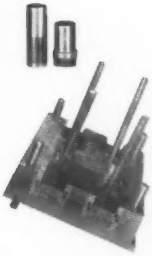
B. $\frac{(3\frac{3}{8}''x1'')x5''}{2} = 12.188$ sq. in.

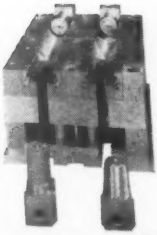
C. $\frac{7''x4\frac{1}{4}''}{2\frac{1}{2}} = 11.9$ sq. in.

D. $\frac{4\frac{5}{8}''x5''}{2.1} = 11.02$ sq. in.

E. $\frac{3\frac{1}{16}''x6\frac{3}{4}''}{2} = 10.55$ sq. in.

F. $\frac{4\frac{1}{2}''x5''}{2} = 10.625$ sq. in.



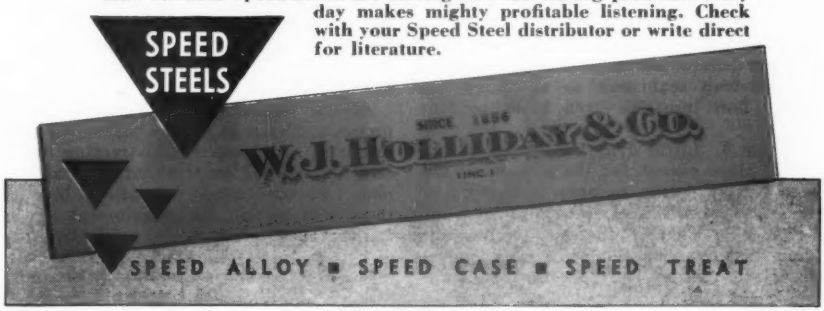


How All Three Speed Steels Make Plastic Pipe More "Flexible"

Carlon is a plastic pipe used to transmit fluids and vapors over irregular surfaces. This Speed Steel Mold—using Holliday's Speed Case (X1515), Speed Treat (X1545) and Speed Alloy hot rolled alloy plate steel helps make Carlon even more "flexible". It molds 6" dia. threaded plastic couplings that join either long lengths of Carlon to Carlon or Carlon to standard metal pipe.

Naturally, these couplings have to be near-perfect to prevent leakage. Carlon Products Corp. reports top distortion-free production at the rate of one shot per minute. Houk Machine Company, Barberton, Ohio who made the mold of Speed Steels for Carlon, reports 40% faster machining than regular hot rolled carbon or tool steels plus an absence of warpage and distortion and longer tool life. Top and bottom plates are of ground Speed Treat plate, male and female core are of Speed Case carburized to Rockwell 55 "C" then ground to size. Other parts are of Speed Alloy.

How versatile Speed Steels are solving new fabricating problems every day makes mighty profitable listening. Check with your Speed Steel distributor or write direct for literature.



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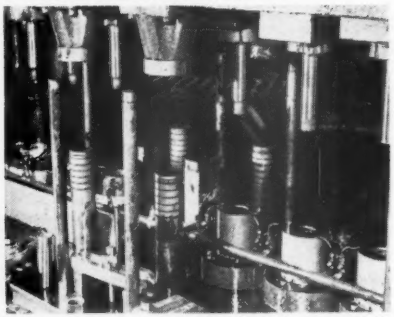
Produced by W. J. Holliday & Co., Inc., Speed Steel Plate Division, Hammond, Indiana. Plants: Hammond and Indianapolis, Indiana

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

. . . Motor Bodies, from page 98



The venturi end of the rocket body is successfully cold-formed in six successive stages on a single press, without need for intermediate anneals.

These are the changes that take place in the shape of the tube during the six stages of the cold-forming operation:

Stage 1. This is a simple reduction in diameter of the tube by approximately ¼ in. with a slight thickening of the tube wall. Of special importance to following stages is the location of the radius at the start of the reduced portion in this first step. This modified nose-in at the top helps eliminate metal pick-up in the next stage.

Stage 2. There is a further reduction in diameter of approximately ¼ in., with a substantial thickening of the wall and a very definite shape given to the radius in the trap seat area so as to control metal flow into this area in subsequent stages.

Stage 3. Little dimensional change takes place except for the nose-in at the top. This is done to prevent pick-up of metal in the 4th stage.

Stage 4. This is the most important stage from the standpoint of metal movement and placement. There is a substantial reduction in diameter and a marked increase in wall thickness at the approximate location of the throat of the venturi tube. This build-up of metal at the throat location controls the final formed size of the throat in the last two stages. The radius which controls the build-up at the trap seat is accurately and positively located in this stage. The actual beginning of the controlled shape and thickness of metal in the conical inlet to the venturi also takes place during this stage.

Stage 5. There is a final reduction in diameter of the dimension required for the finish machining with an axial redistribution of metal. The conical venturi inlet is shaped for final coining and metal is built up for machining the trap seat.

Stage 6. In the final stage, the conical venturi inlet and trap seat area are coined to final shape with no further change in diameter or wall thickness through the straight portion of the motor body.

After the cold-forming operation, the motor bodies are heat-treated to give

Sectional views show work done at each stage in the cold-forming sequence.

them a minimum yield strength of 145,000 lbs. psi and no more than 10 percent elongation. Heat-treated motor bodies have the required final Rockwell hardness of C34 to C37.

At the beginning of the rocket motor program, Evans engineers considered both salt bath and furnace heat-treating methods, but decided on the controlled atmosphere furnace as an expedient because there was no salt bath equipment in the Detroit area set up for a production run of this type. Although the furnace heat-treating method produces a little more distortion than salt bath would, the controlled atmosphere furnace has proved satisfactory and meets all requirements.

A numerical code system was devised by Evans engineers to keep heat treat batches and their corresponding pull-test specimens properly identified. Permission was given to heat-treat three plain tubes with each batch of 500 motor bodies, thus eliminating the necessity of working with the extremely short pull test sections

(Continued on page 114)

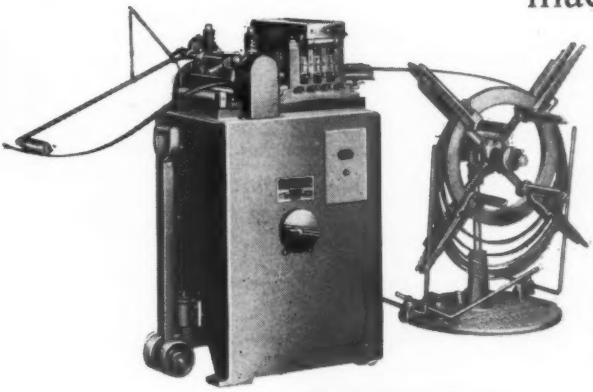
The low cost way

from coil stock . . .

to flat stock . . .

for flat blanks . . .

is through LITTELL straightening machines . . .



Thirteen medium and heavy duty models of Littell Straightening Machines straighten coil stock of all standard widths and thickness. No. 308 series straightens stock from a fraction of an inch to 8″ wide, and from .018 to .065″ thickness. No. 4 series straightens stock from a fraction of an inch up to 12″ wide, and from .065 to .125″ thick. Variable speed transmissions are easily adjustable to the requirements of presses, shears or slitters.

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SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

. . . Cold Forming, from page 104

stainless, a shear is ground on the die. The subject of clearance is controversial; thus with the straight chromium steels a procedure similar to that employed in the straight carbon steels has been found satisfactory.

The clearances required in blanking the austenitic stainless compositions will vary with the gage; thus, for light gages, clearance between punch and die should be from 0.001 to 0.0015 inches [11], and for the heavier gages a clearance between 0.0015 to 0.002 inches may be employed. These clearance values are somewhat closer than that necessary in the blanking of the carbon steels. In the event that clearances are too great, the metal will work harden during blanking procedure resulting in that excessive strains are placed on both the tools and the press. The subject of burrs remaining on the edges after a blanking operation may be of importance; in some instances the non-removal of burrs on the cold worked edge of a blank may cause die surface scratches as the material travels inward and down in subsequent forming operations. Deburring, where this is required, is considered good practice.

Good blank layout will pay dividends in the saving of critical material; the factors determining efficient blank layout being size and shape of the blank, the method available for cutting the blank, the labor involved, etc. In the production of circular blanks as illustrated in Figure 1, the die shear and notched blank would have a decided advantage in material savings. However, before proceeding with method B in preference to method A, it is best to determine relative formability; in some cases, the additional hold-down obtained in method A is required. In the blanking of a cross shaped part as illustrated in Figure 2, method E would be preferred.

Progressive blanking from either strip or coil is the preferred method; this involving a blanking press which is in continual operation, a gadget which controls the rate of travel of the material per stroke of machine, and in the case of coil stock, a decoiler. In the event that strip stock is employed, two tables are used, the length of which is in accordance to the length of the strip. These tables are placed on each side of the press. With coiled material, the decoiler is placed directly in back of the machine; the material passing into a vat containing a lubricant into a set of rollers to distribute

(Continued on page 132)

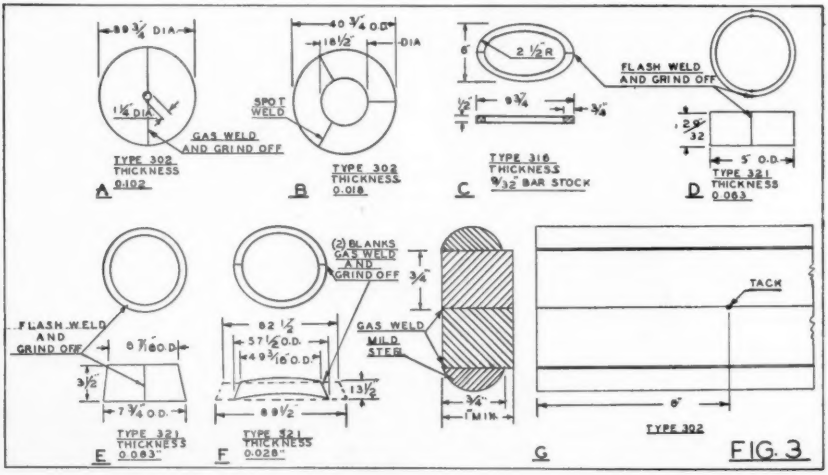
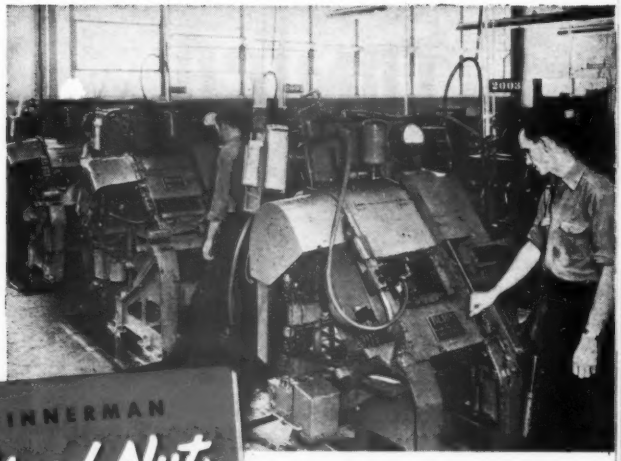


Fig. 3. Preformed and welded blanks. Courtesy International Nickel Co., Inc.[1]



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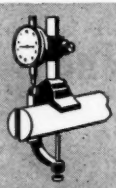

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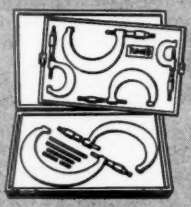

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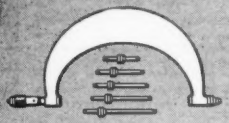

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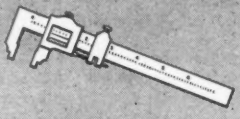

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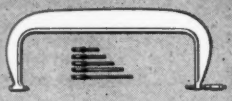

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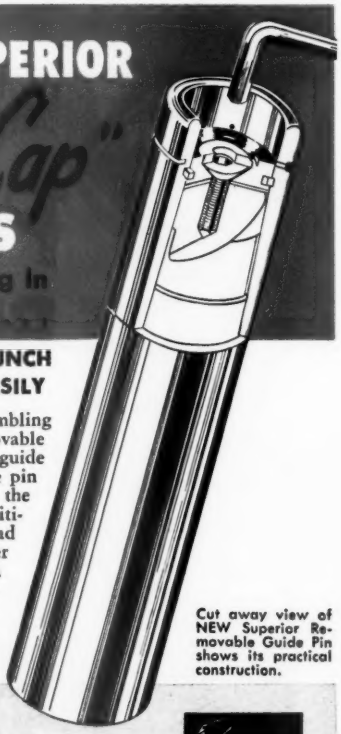

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Cut away view of NEW Superior Removable Guide Pin shows its practical construction.

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1. Removable caps prevent punch holder from locking.
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4. Designed for use on all die sets.
5. One man can remove large punch holder in approximately 3 minutes.
6. Punch holder assembled easier and more accurately.
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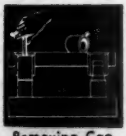
8. Taper seat for cap insures positive alignment.
9. Damage to costly dies in assembly and disassembly is eliminated.



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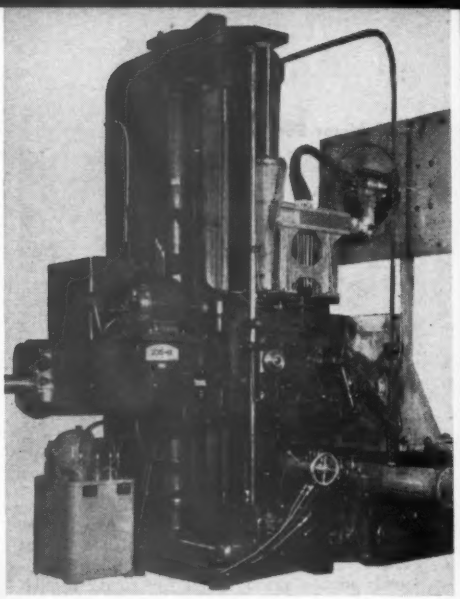
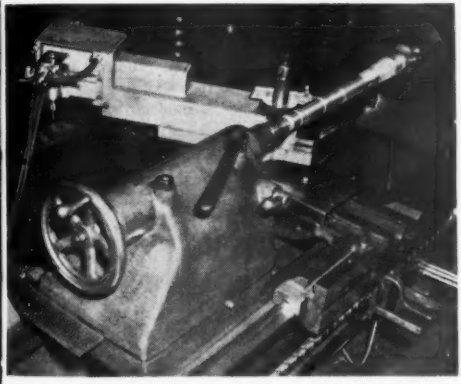




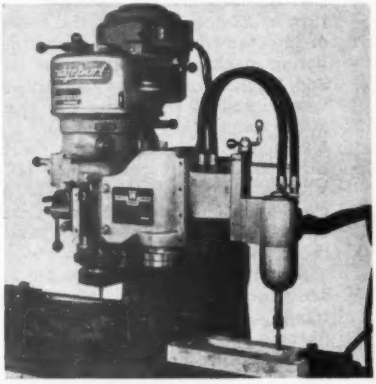
In addition to building duplicators for all sizes of boring mills, milling machines, lathes, planers, shapers, grinders and special purpose machines Walker builds duplicators for small machines such as high speed heads.

Send sketch of part and name of machine for immediate information

Walker's new design of step turning duplicators for lathes,—the most accurate duplicator made.

All Controls and template are in front allowing full swing of the lathe over cross slide.

Simple hydraulic Controls,—no air —no electronics—no relays.



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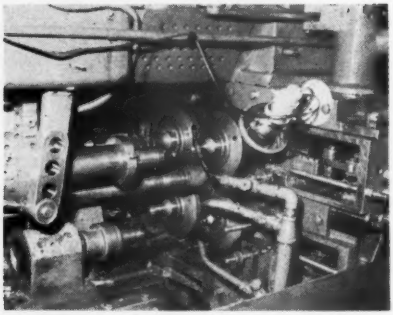
Walker HYDRAULIC DUPLICATOR CO.

P. O. Box 450 STANDISH, MICHIGAN

Pioneer Designers and Builders of Precision Duplicating Equipment

. . . Motor Bodies, from page 106



Multiple-spindle automatics machine additional details on cold-formed motor bodies.

that can be cut from the formed motor bodies. Ordnance bomb symbol, steel heat letter, and heat-treat group number appear on the plain tubes for ready identification.

Following the heat-treating operation, the motor bodies are completely machined inside and out, except for the conical inlet of the venturi which was coined to size during the cold-forming phase of the manufacturing operation.

The centerless grinding operation is performed on a Cincinnati grinder. Conematics rough-machine the OD and ID and turn a 22-deg angle on the venturi end of the motor bodies. An Excello precision boring machine finish turns the OD, faces and finish bores on the venturi end. The venturi end of the bodies are knurled on a Cleveland screw machine, and a Bullard Multimatic Six counterbores for buttress threads. Rough boring on the ID is done with a Monarch lathe; a drill press is used to finish ream the ID and trap seat, and a Cleveland lead screw tapper taps the $\frac{5}{16}$ buttress thread.

Automatic holding and handling devices are provided wherever possible. On the tapping operation, two air-operated Mead fixtures are mounted on a reciprocating table. While the motor body held in one fixture is being threaded, work is unloaded and loaded on the other fixture. Fixture operation is fully automatic, with limit switches opening and closing chucks, and actuating the table.

Cemented carbide tooling is employed for all machining with the exception of tapping, knurling, and the earlier cut-off.

When the final machining operations are done, every rocket motor body must successfully pass two hydrostatic tests of 25,000 lbs psi with a minimum of 48 hrs between tests.

After the hydrostatic tests have been completed, the motor bodies are Parkerized and sent to the final assembly station where the spot-welded, aluminum tail fin assembly is fitted to them.

A magnetic masking device is used to protect the fuse contacts when the motor bodies are run through an automatic spray conveyor for their protective coat of olive drab. The motor bodies are mounted on revolving spindles and whirled around as they pass through the paint spray booth.

During World War II, the engineering and productive facilities of the Evans Products Company, which has plants in Plymouth, Mich., and Coos Bay, Ore., and Vancouver, B. C., were busy producing 54 varieties of military needs. From the Evans production lines came air filters and winterization kits, aircraft engine mounts and aircraft troop seats, searchlight chassis, and wrenches for Bofors guns.

Now, the same productive energies are again at work turning out not only the rocket motor bodies but an impressive variety of other products to meet the demands of a streamlined national defense program.

Automatic control of air-operated fixtures permits operator to load and unload one chuck while the other is in working position.

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SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

What Is a Safe Press Shop?

A safe press shop, if the word "safe" implies absence of hazard, really does not exist. We have made great strides toward improving safety in our industrial plants, but, we are not as yet at the point where a press plant may be considered 100 per cent safe. If, at the very beginning, we clear up the point that there is no safe shop, we can move forward with some thoughts and considerations as to what we can do toward eliminating hazards.

Mr. Johnson's article originated as an address before the National Safety Council's 1951 Congress. We gratefully acknowledged the Council's permission to present it here. Ed.

by **Russell Johnson**
Safety Engineer,
CRONAME, INC.,
Chicago, Ill.

Mechanical safeguarding will always have limitations. At least we have not seen the ultimate in safety devices. New and improved presses are few compared to older presses still in use. Nevertheless, where management recognizes hazards and does something about them by providing the best obtainable guarding devices, better inspection methods, and improved training programs, there has been a great reduction in accident frequency over the past ten years.

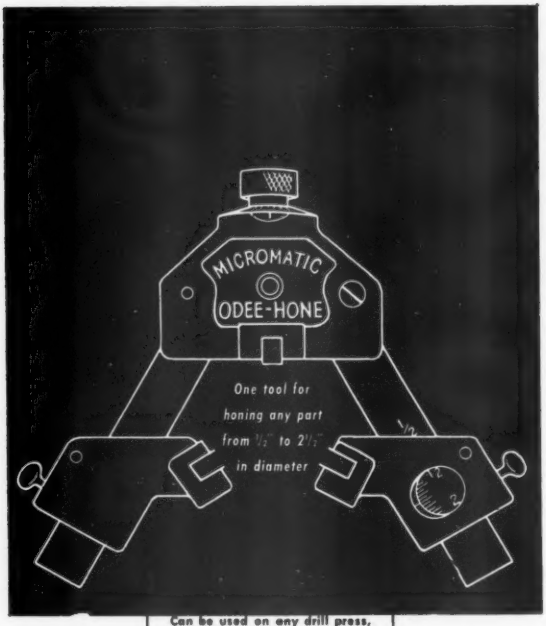
There are comparatively few shops that boast of top supervision in their press room. Few boast of preventive maintenance programs. Poor housekeeping and overcrowded conditions prevail all too often.

While all press shops cannot convert to ideal working conditions, steady improvement can be made in every shop.

That some concerns operating press shops have better frequency and severity rates than others indicates clearly that safer conditions can be accomplished if steady improvement is made. In such a plant, one showing consistent progress, the safety engineer can consider himself a successful person.

It is his ambition to reduce the accident frequency and severity rate. He has constantly in mind that the management must consider the welfare of employees above anything else and that this really means safety first for full production. His is the slogan "to economize is to safetyize".

A safety engineer always



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needs plenty of courage. His leadership, confidence, and wholehearted belief in safety are large factors in making any program successful. Add some ability, perserverance, patience to train employees and supervisors, and to sell management on justifiable expenditures.

It is only by such repetition that safety ideas will become instilled to the point that duties are performed automatically in a safe manner. Developing good work habits in employees is a long-range program; it cannot be done quickly.

The one best source of communicating safety is through the departmental foreman; he knows his people and their jobs better than anyone else and it is the safety engineer's experience that if he works very closely with supervisors a more enduring result is more quickly obtained.

My emphasis has been largely upon the leadership qualities necessary in a safety engineer and his contacts with the personnel, directors or supervisors to bring across to them the good habits that will make their jobs safe. This all adds up, perhaps, to a hard way of saying that we must instill habits of care and thought in everyone.

I think perhaps the works of Dr. Sappington can be helpful in your safety programs. I cannot present them as adeptly as the doctor did on this occasion ten years ago, but with your indulgence I will give you the thoughts as he gave them to me.

First, I would like to give you seven words, Keenly, Wisely, Enough, Properly, Adequately, Well and Efficiently.

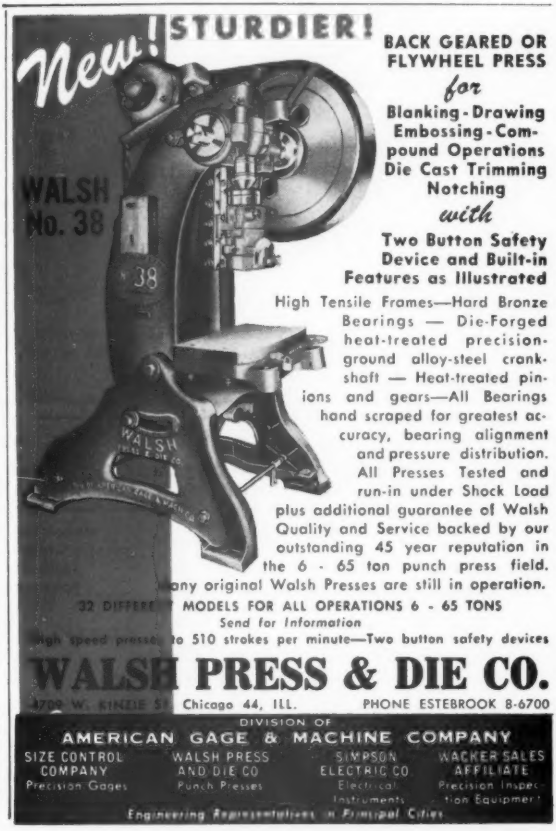
Now, to put these words to work for us, I will add seven more words in their proper place. Before keenly we place observe. To observe is to pay attention; to notice; to watch. To observe keenly is to be interested, sensitive, intense.

We place before the word wisely, the word reflect. Reflect wisely. To reflect, in the meaning that I am trying to convey here, is to give back an image or likeness of your action. Then, to reflect wisely is to think and act with discretion.

Preceding the word enough we place the word study. Study enough. One must carefully investigate and examine.

Now we come to the word properly, and ahead of properly we place the word interpret. To interpret you must comprehend.

(Continued on page 139)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. . . **Carbide Segregation, from page 86**
two flat bars of ½ inch thick by 3 inches wide M-2 type high speed steel were made with different degrees of segregation. Izod impact samples were cut from these bars in both longitudinal and transverse directions. After heat treating to Rockwell C 65 the impact strengths were found to be as shown in Table III. These data further confirm the adverse effect of carbide segregation on the toughness of high alloy tool steels.

The influence of segregation on the dimensional stability through heat treatment was studied on an oil hardening high carbon-high chromium steel and on two high speed steels. Standard Navy distortion ring test specimens were machined, as shown in Figure 3, from both segregated and non-segregated 2.20% carbon, 13% chromium steel. The various dimensions were carefully determined in the annealed condition, as quenched condition, and after tempering over a wide range of temperatures. Since the "C" dimension is generally conceded to be the most sensitive to distortion, and for the sake of clarity, only the changes in this dimension are reported. Identical trends were found

(Continued on page 136)

Table I

INFLUENCE OF CARBIDE SEGREGATION ON IMPACT STRENGTH OF T-1 HIGH SPEED STEELS

Tempered at °F	Hardness Rockwell C	Unnotched Izod Group A Little or No Segregation ft-lbs.	Impact Strength Group B Some Segregation Present ft-lbs.
950	64.0	28	17
1000	65.0	24	18
1050	65.0	27	17
1100	64.0	26	17
1150	61.5	28	19

Material: T-1 high speed steels, ½ square bar stock.

Heat Treatment: Hardened from 2350° F, 3 minutes at temperature in electric muffle furnace, oil quenched. Tempered 2 + 2 hours at indicated temperatures.

Intercept Grain Size: 10:8.

Table II

INFLUENCE OF CARBIDE SEGREGATION ON IMPACT STRENGTH OF M-2 HIGH SPEED STEELS

Tempered at °F	Hardness Rockwell C	Unnotched Izod Group C Little or No Segregation ft-lbs.	Impact Strength Group D Some Segregation Present ft-lbs.
1000	65.5	41	23
1050	65.0	39	27
1100	63.5	32	28
1150	59.0	41	28

Material: M-2 high speed steel, 7/16 inch square bar stock.

Heat Treatment: Hardened from 2250° F, 3 minutes at temperature in electric muffle furnace, oil quenched. Tempered 2 + 2 hours at 1050° F.

Intercept Grain Size: 11.2.

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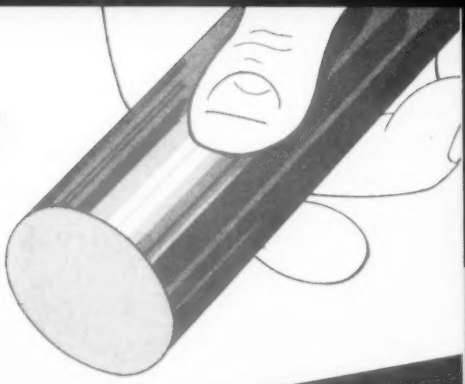

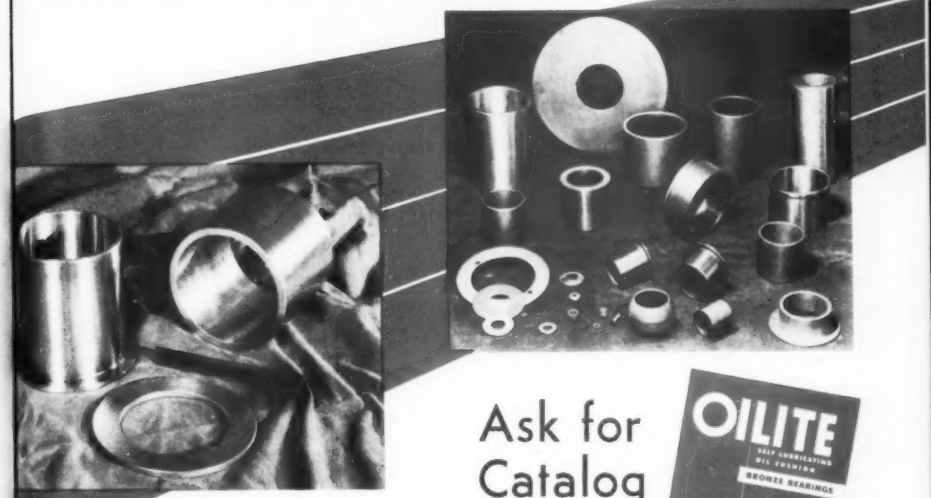

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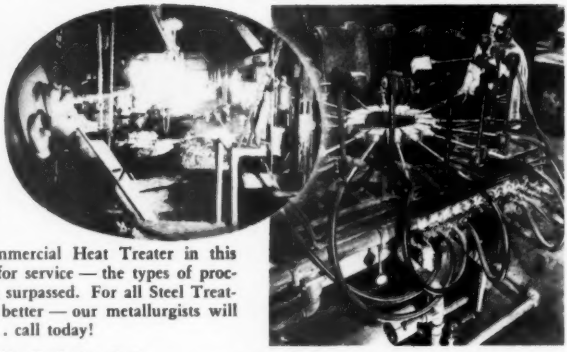

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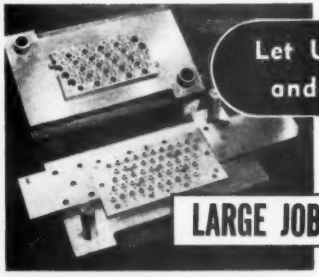

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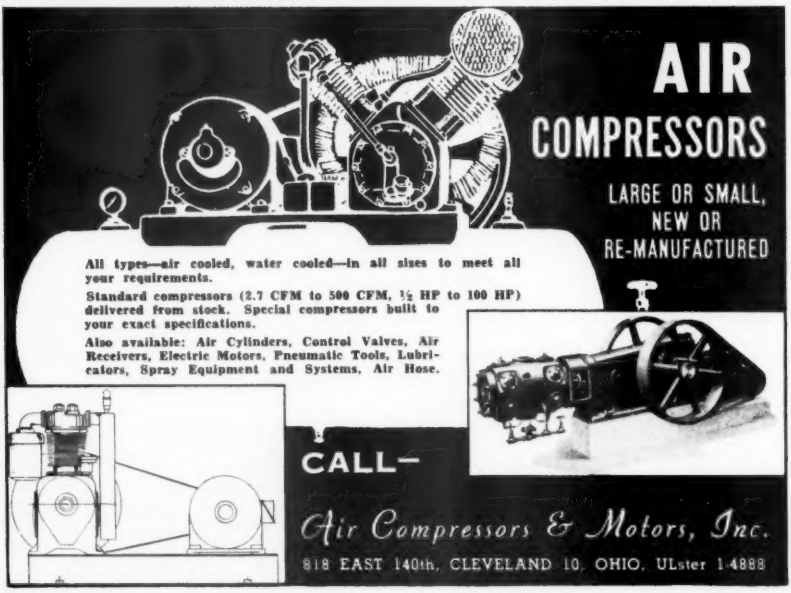
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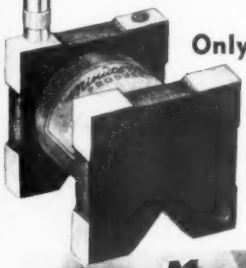

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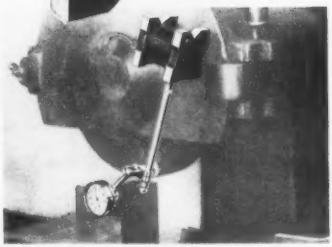

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finish was required on the wheels in order to eliminate the lines left on the blade by the short cutter in its 50 passes through the metal.

John W. Prescott, a duplicating machine operator, proposed — through the company's employee-suggestion plan — that the flute lengths on the cutters be lengthened from .090 to .250, the full depth of the cut required to shape the blade. This permitted the cut to be made in a single pass.

Time studies showed savings of 47.87 hours for machine time, plus 50 hours of hand finish time per 100 pieces, or a total saving of 97.87 hours per 100 pieces. The old tools had a maximum life of three wheels, and an average life of 1½ wheels per tool. The longer fluted cutter showed up with a minimum life of six wheels and a maximum of 14 wheels. The flute length was added by the supplier at no extra cost to AiResearch.

Prescott's suggestion was awarded $840 based on 20% of a total six months savings of $4200 to AiResearch. This is cited as a good example of the constructive thinking encouraged among AiResearch workers. In 1951, the company expended $20,500 for 250 award-winning suggestions. During the same year, the company saved more than 29,000 hours, $19,000 in materials, plus other savings as a direct result of the suggestion program.

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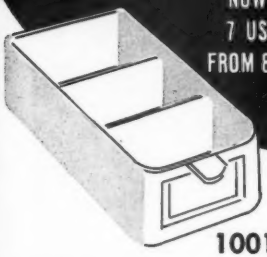

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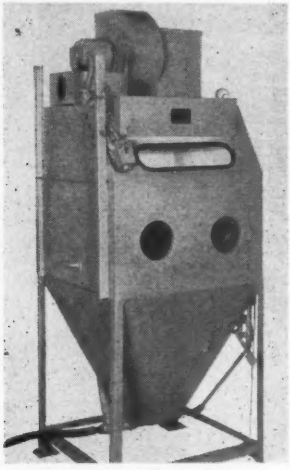
An abrasive wet blast machine, announced by Abrasive Wet-Blast, Inc., Niles, Ohio, produces a refined surface finish on tool, die, or product parts. The finish may be closely controlled by proper selection of abrasives to suit the particular job requirements. Suspended in water, the abrasive is applied by air pressure.



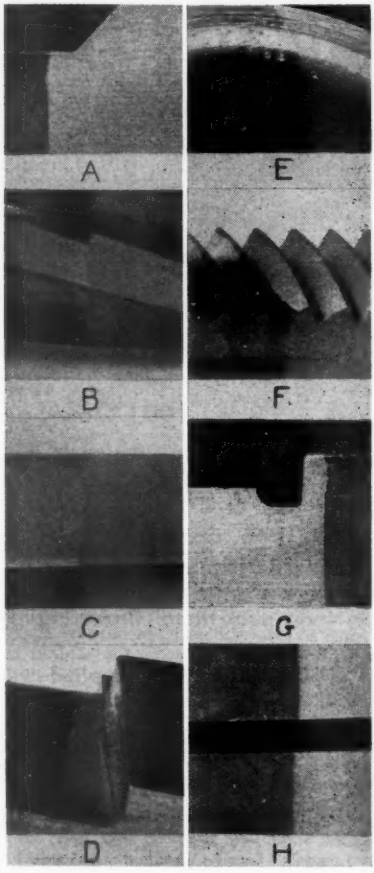
Abrasive Wet-Blast Machine.

Wet blasting is a fast economical method of cleaning light burrs, feed marks, hard crusts, rust, heat treat scale, old paint or coatings, and platings from parts. It produces a good appearance and a surface that can often be used without additional treatment. Where a high gloss or mirror finish is required, buffing time is greatly reduced by first wet-blasting.

Defects, cracks, checks, and flaws are easily detected. Defective tools can thus be kept from going into production, thereby eliminating premature tool failure and costly downtime. By blasting cutting edges of tools after grinding, a smooth notch free, burr free, and slightly radiused cutting edge is produced that gives up to 50% and sometimes greater life to the tools between grindings.

A wet-blasted surface presents an absolutely clean, oxide-free bond for plating. No washing or chemical bath is necessary.

The lubricant-retentive value of the wet-blasted finish enables moving parts to mate more perfectly, last longer, and resist galling and burning. On such parts as instrument dials, reflective ability of the finish can be nearly eliminated in order to improve the dial's readability from any angle.



Unretouched photos above show graphically the improved wet-blasted surface finishes of new tooling:

(A) Chamfer tool
(B) Spiral reamer
(C) Straight edge cutter
(D) Counterbore
(E) Small draw die
(F) Tap
(G) Form tool
(H) Extruding die

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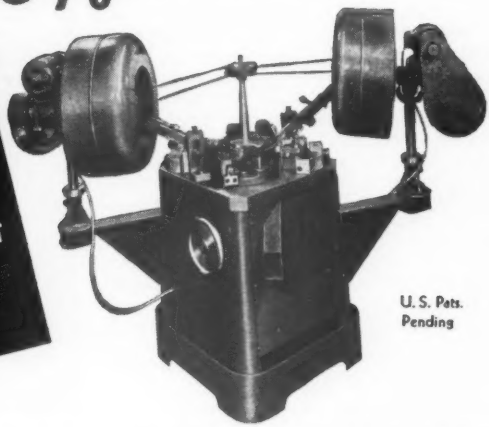

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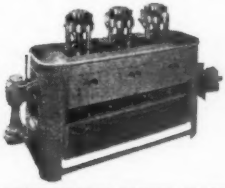

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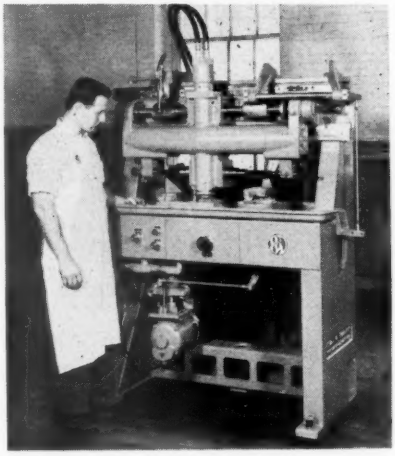
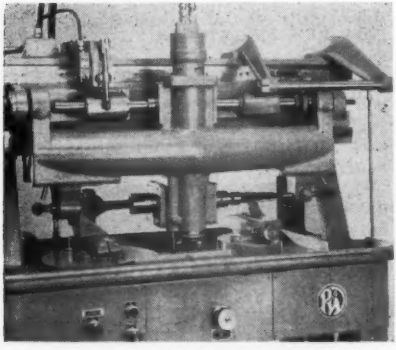
SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

New Automatic Machine Grinds Complete Jet Blade Airfoils With Uniform Accuracy

The accompanying illustrations show a new automatic grinder that has been developed for finish sizing all irregular and twisted airfoil sections of jet engine compressor blades and turbine buckets. The machine has been designated the Turbine Blade Airfoil Grinder. The complete airfoil section, including the important leading and trailing edges, and the area close to angular roots or shrouds—is ground in a single automatic cycle. One operator, tending a battery of machines, has only to unload the finished blade, load a forged or fabricated blade blank and restart the cycle. A high rate of production held to close and consistently uniform tolerances is achieved at a low cost per blade.

The machine operates on the duplicating principle, copying from an airfoil master. The master is an exact duplicate of the blade shape desired, except a uniform envelop of material is added to stiffen it against deflection. Stock is removed from the work by a high-speed coated abrasive belt. The belt runs over a small grinding contact wheel. The use of abrasive belts for precision grinding eliminates the complicated problem of maintaining proper grinding wheel and tracer wheel size relationship, and in addition, provides a large grinding surface despite the necessary small diameter contact wheels needed to grind the concave surface of the airfoil. Also, dressing and truing operations are not required.





Photos courtesy Pratt & Whitney Div. Niles-Bement-Pond Co.

The machine is composed of a main frame, at the top of which a pivoting work frame is suspended from a traversing carriage. A center horizontal beam carries a fixed master follower roll and the grinding belt unit. As the work and master rotate simultaneously, the master, resting against the follower roll, moves the work frame in and out and causes the grinding contact wheel to duplicate the shape in the work.

The rate of rotation is automatically varied during each rotation to cause the leading and trailing edges of the blade to pass the grinding contact faster than the concave and convex surfaces. To keep the grinding contact presented normal to the twisted foil at all times, the grinding belt wheel is swiveled by cam action. As the workpiece rotates it is traversed lengthwise across the grinding contact. A compound motion is added at the end of the traverse pass when grinding blades with angular roots or shrouds.

A roughing pass removes from .002″ to .006″ on a side per traverse; a finishing pass .001″ per side. A rough milled blade blank with a maximum envelope of .010″ is ordinarily finished in four traverses.

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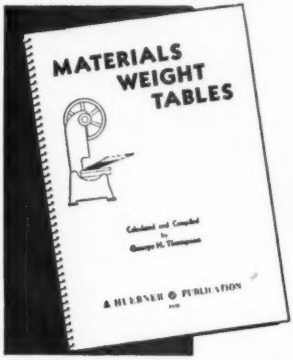

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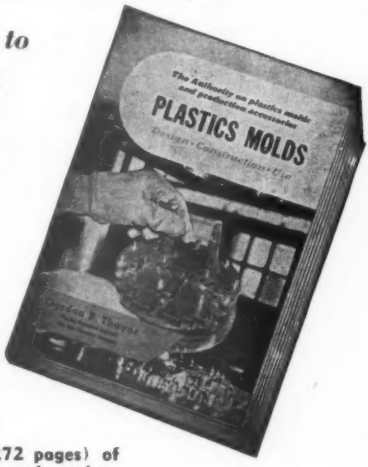

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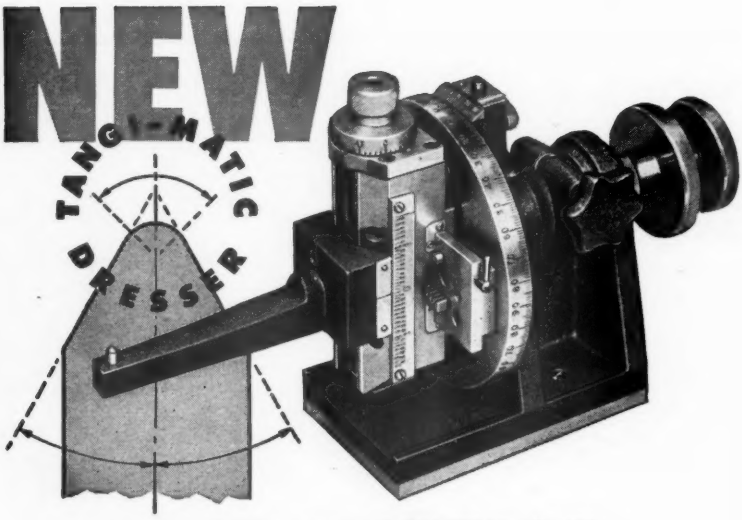

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SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

Hydraulic Drive Powers Lathe Turret

This simple and economical attachment which mechanizes turret lathe work is designed for turret lathes with 6-station turrets and is adaptable to lathes with bar stock capacity up to 2½", can be attached to any standard make hand or power operated ram-type turret. It is simple and efficient in operation and provides a continuous or interrupted cycle to speed short or long run work.

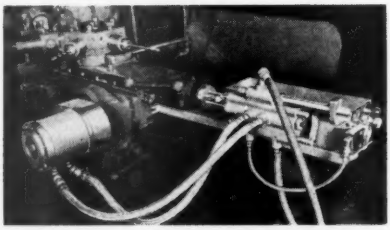


Photo courtesy Viking Industries, Rockford, Illinois.

The complete unit consists of a ¾ h.p. motor, two pumps, reservoir, fluid motor, control valves, and connections. Pumps, motor, and reservoir fit under the end of the machine. The fluid motor attaches to the turret pilot-wheel shaft. The control body which mounts on the end of the turret, is compact and small in size. The entire assembly requires no additional floor space. Its hydraulic circuits and settings are simple and easily understood. The attachment can be installed on any standard machine in less than 4 hours by an average mechanic.

Automatic individual cycles and feed rates can be quickly and easily set to suit different operations in six or fewer number of turret positions. Individual circuit control rods and adjustable dogs provide the means for controlling the rate and length of feed. Individual cycles for each of the six positions can be set for rapid approach, dwell, infinite adjustable feed, and quick return.

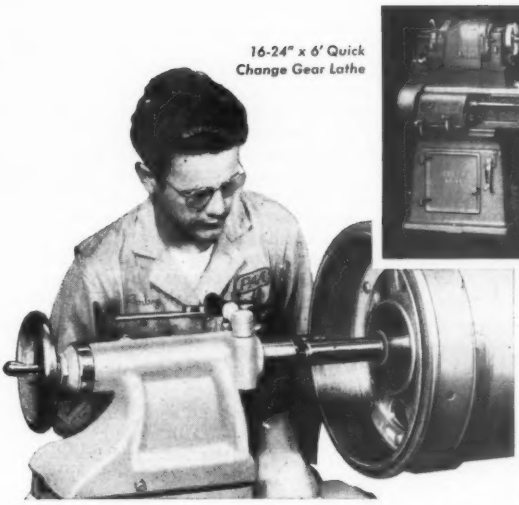
Once set up, the operator simply starts the cycle with a hand lever. Stop is automatic after any series of operations. While the turret drive is in automatic operation, the operator is free to inspect and prepare the next piece for chucking. No operating feature of standard machines are sacrificed. The operating efficiency of the attachment provides a simple method of increasing production in some cases as much as 300%. Smooth hydraulic power helps reduce tool breakage and insures better surface finishes. The attachment is designed for long, continuous service with little or no maintenance required. It is economically priced, and sold on a guaranteed performance basis.

Backing Pad Cooled by Forced Draft

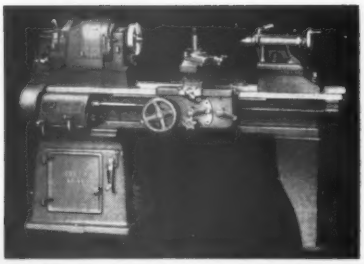
The Spiralcool backing pad is now being made with a slotted aluminum hub and with an improved rubber compound which has resulted in an increased pad life of 20%, as well as in a lighter and better balanced pad.

The forced-draft hub cooling of the abrasive disc is an exclusive feature, and is of particular interest to users in that it results in abrasive disc savings of 20% to 30%. Some major automotive concerns report that they are saving substantially more than 30% of their former abrasive costs, due to the fact that the discs run cool, do not load up, and therefore can be worn down smoothly and evenly to the maximum usage of the cutting surface. The pads are available in four diameter sizes and three degrees of rigidity.

Photo courtesy Spiralcool Company.



16-24" x 6' Quick Change Gear Lathe



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SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

International Limits Standardization

A world-wide standard system of tolerances and allowances between cylindrical parts applicable in the mechanical and other industries will be discussed by experts from eight countries, meeting in New York, June 16-19.

The meetings will be held at Columbia University in conjunction with the second triennial General Assembly of the 33 nation International Organization for Standardization (ISO), with the American Standards Organization, the U.S. member of ISO, acting as host.

General Jean Pierre Nicolau heads the French delegation, and will preside over the meetings. Other national standards bodies participating in the subcommittee work are those of Belgium, Netherlands, Poland, United Kingdom, Sweden, Switzerland, and Czechoslovakia. The United States is not represented in the work of the subcommittee, but members of the American Standards Association Sectional Committee B4, Limits and Fits, sponsored by the American Society of Mechanical Engineers, may attend as observers.

According to the draft agenda of the subcommittee, the delegates will discuss tolerances on tapers, tolerances on form, dial gages, and selective fit. They will also take up revision of eight points of the pre-war system of limits and fits.

Last year the 16 participating nations of the ISO Technical Committee on Limits and Fits formally reapproved an International Recommendation for the Reference Temperature of Industrial Gages and Measuring Devices. Previously there had been indecision and variation on the temperatures at which gages for metal fits were to be used to obtain measurement, without allowance for expansion or contraction. The temperature has now been internationally standardized at 68° F (20°C). This ISO recommendation had been an American Standard since 1925.

Seventy-six ISO technical committees are now working on standardization projects in such varied fields as plastics, iron and steel, screw threads, agricultural machines, textiles and textile machinery, gears, and transfusion equipment for medical use. Thirteen of these committees will meet during the two-week plenary session of ISO in New York in June.

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Progressive Mechanization

A new visual program aimed at boosting American productivity by offering a modern step-by-step approach to the problems of industrial mechanization has been announced by the General Electric Company.

The program is designed for use by large industrial firms, machinery manufacturers, electric utilities, consulting engineers, contractors, trade associations, etc. It consists of three basic parts: a 16mm sound-color motion picture, a manual, and a survey form and check list.

The film, "Motors In Industry," sotitled because 86 percent of all industrial horsepower is provided by electric motors, explains the concept of progressive mechanization in four step-up stages. It goes from hand operation to simple machine, from simple machine, to improved machine, from improved machine to automatic control, and from automatic control to continuous process. The movie dramatizes mechanization by showing interesting and impressive examples that apply to all industries. Running time is 27 minutes.

To follow up the motion picture with more specific information and suggestions, the 16-page Progressive Mechanization manual (GEA-5789) tells what progressive mechanization is, explains its effect on productivity, product quality and costs, and shows how it can be and is being applied to a number of different industrial situations.

The survey form and check list, the third part of the program, is a single sheet extracted from the manual. On one side it has a form for enumerating the machines and processes recommended for investigation, and on the other side is a check list of suggested areas of improvement.

The Progressive Mechanization program is packaged in a handy kit which contains 1 print of the motion picture, 5 copies of the manual, and 25 copies of the survey form. Supplementary publications on motors, control, industrial power distribution equipment, etc. are also included.

The entire presentation may be purchased outright from G.E. at cost, or is available for single showings through any of the company's apparatus offices.

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Castings For Heavy Presses

To speed the construction of giant presses needed for the production of high-performance aircraft, a team of specialists left recently for Europe to arrange for the production of very large castings in European foundries. They will take drawings for 69 separate castings ranging from 50 to 150 tons.

Defense mobilization officials have approved the procurement of castings from European foundries as a possible alternative to a costly, indefinite delay in building the massive extrusion and forging presses.

It was emphasized that the castings sought in Europe are very large ones which are capable of being produced only by relatively few facilities in the United States, and that all of these are heavily booked with orders for important defense and defense supporting projects now under construction here.

Any relief obtained by the placement of orders for castings in Europe would therefore benefit the defense program here, not only by speeding up the press program, but also by avoiding any delaying interference with comparable castings now scheduled for production in U.S. foundries.

The Air Force heavy press program consists of building eight giant forging presses, ranging in size from 25,000 to 50,000 tons (applied pressure, not weight), and nine very large extrusion presses to be operated by five separate contractors. These will be able to produce large aluminum forgings and extrusions for transsonic aircraft, eliminating much of the costly and tedius metal-working now required in fabricating aircraft sections.

For example, large airframe sections can be formed in a few minutes from an aluminum ingot by several operations on a heavy forging press. Stronger parts can be produced at less cost and with less waste of metal.

The Air Force is attempting to speed the program so that the first presses will be available in 1953. The giant extrusion presses, ranging from 8,000 to 20,000 tons pressure, will also permit the forming of larger and stronger parts for jet aircraft than is now possible.

The largest forging press in operation in this country is rated at 18,000 tons, and the largest extrusion press is a 5,500-ton press.

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Subcontracting For Defense

Locate the tough jobs and then go after them, is the advice of the Chamber of Commerce of the United States to would-be subcontractors seeking defense production orders.

Find the bottleneck that is slowing output on a prime contract, says the Chamber in a booklet "Subcontracting for Defense", then show the contractor how to meet his difficulties through use of his plant under a subcontract.

The 36-page publication, prepared by the Chamber's department of Manufacture, makes it plain that the manufacturer who is on his toes is the one who gets orders for production of the multitude of items that go into defense-end products. It indicates sources to which manufacturers may look to obtain leads. Also it suggests ways of looking ahead for subcontract opportunities that will develop as the defense mobilization program goes forward.

To uncover business, the Chamber suggests starting with defense producers who know the subcontractor's record and capacities. Likely prospects are large companies that customarily do subcontracting in volume.

Underscoring the fact that the man who goes after business vigourously is the man who gets business, the pamphlet points out that this rule holds especially true in securing defense orders. Subcontracts will be let, says the manual, to those able to convince prime contractors of superior ability to produce difficult articles.

The Chamber says that the decision to spread defense mobilization over a longer period indicates that successful bidders can look forward to steadier long range employment in their plants, even though the immediate result may be sharper competition among subcontractors.

Surveys indicate that half the money received on some major prime contracts is paid out to subcontractors and suppliers. Many orders placed under early military appropriations still have to reach the subcontracting stage. That, says the Chamber of Commerce, means continuing future subcontracts to those who have energy to search out opportunities and go after them with vigor.

"Subcontracting for Defense" may be obtained for 50 cents a copy from the Chamber of Commerce of the United States, Washington 6, D. C.

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. . . Cold Forming, from page 108

and press excess lubricant and then into the press for blanking. Manual tension is placed on the material and either a finger or gauge pin controlling the amount of travel for each stroke of the machine. Strippers are usually provided and the material may either fall in a tote box below the press or air pressure may force the blanks into an inclined container located in back of the press; the latter method being limited as to size of blank. The use of strip precludes handfeeding and support by the previously mentioned tables; tension being applied as the strip is fed for blanking. Reversal of strip and refeeding into the press is usually done. Thus, in Figure 2, method C could be done with coils. whereas methods D, E, and F would employ strip stock, approximately 12 to 14 foot lengths.

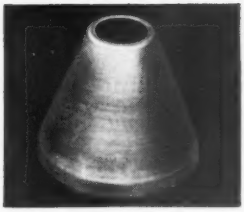
Of interest is the use of preformed and welded blanks as illustrated in Figure 3; the excellent weldability of the austenitic stainless being taken to advantage resulting in a considerable savings in material. Large blanks are welded in the manner indicated by (a), whereas, blanks with large center holes can be made from segments as illustrated in (b). Parts which are more cylindrical or conical [1] than flat are generally formed from bent and welded tubular or conical blanks as illustrated in (d) and (e); these being obtained from flat sheet developed metal blanks. Flash welding is usually the preferred, however gas welding is often done on heavy cross sections as indicated by (g); this section also illustrating the use of preformed material that is welded and submitted to further forming operations. Any defects in weld can easily be repaired by rewelding after forming.

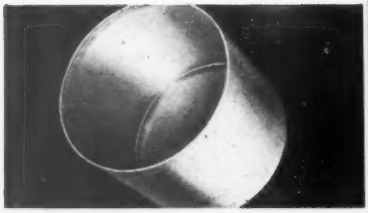
Punching operations where the punched material is scrap, requires a flat die so as not to distort the work; thus any shear that is required for the punching of medium gages is placed on the punch. When subsequent forming operations on a blank is such that distortion of punched holes is not experienced, punching may precede forming. Where holes are close together, stepped punches are often employed not only to avoid overcrowding and possible distortion, but also to obtain shear. Experiences on the breakage of punches in case of chromium stainless steels (both types 410 and 420) revealed that one effective solution lies in the provision of ample clearance and liberal fillets in the punch design.

Compound blanking and punching, or cutting a blank and cutting a part or parts out of it at the same time and in the same die is the most accurate method of producing a shape with holes in it. The blank can never be pushed through the die, though in many cases the punchings may be. In other instances, both the blank and the punched out centers are returned to the surface of the die to be removed with the scrap. Where dies with spring stripping rings and spring center knock-outs are used, the blank may sometimes be pushed back into the stock sufficiently to carry it out of the die. Inclined back presses are often used for compound die work to permit the blank and punchings to slide off the back as the sheet and scrap are moved across from side to side. In these cases crossbar knock-outs in the press slide and cam or crank actuated knock-outs in the bed may be used to time the stripping actions. The assistance of an air blast or sweep-off may be necessary.

Perforating, or the punching of many identical holes can be performed either on a single or multiple punch operation. Gang punches must be carefully adjusted and set with the proper clearances in accordance to the grade of stainless to be perforated. They must be kept very sharp for successful operation. Stripper attachments for stainless are usually heavier than those employed in the perforating of the mild steels, and the use of a good lubricant is usually suggested. As in blanking or punching, approximately twice the power ordinarily used for the plain carbon steels is required with the speed of operation reduced; this value varies between ⅓ to ½ the speed used for perforating mild carbon steel. It is advisable [11] not to attempt to perforate the straight chromium steels if the holes are smaller in diameter than the thickness of the material. With the austenitic stainless steels, the limitations in the diameter of the perforation is from one to one and one-half times the thickness of the material. Clearances are about the same as that employed in blanking operations.

(Continued on page 193)





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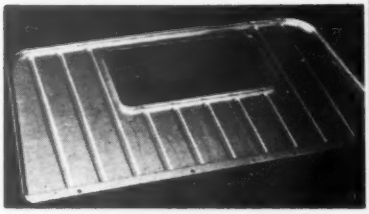

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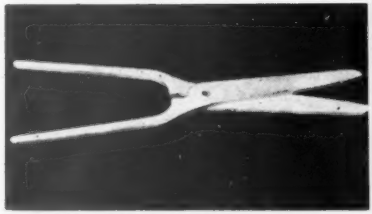

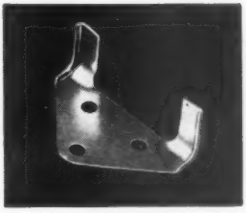

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A New Approach To Contour Turning and Internal Copying

A new copying lathe, the New Britain +GF+ has just been made available and will be built in the plant of the New Britain Machine Company.

This new lathe which has been under development since 1938 is originally the product of George Fischer Limited of Schaffhausen, Switzerland. Approximately 1500 are operating in every industrial European country and in such places as Australia, Japan and South America.

In adapting the +GF+ copying lathe to the requirements of American manufacturing, New Britain engineers were careful to preserve all the basic features which have made the original outstanding in accuracy and versatility. The principal change involves an increase in power input and adaptation to American electrical standards.

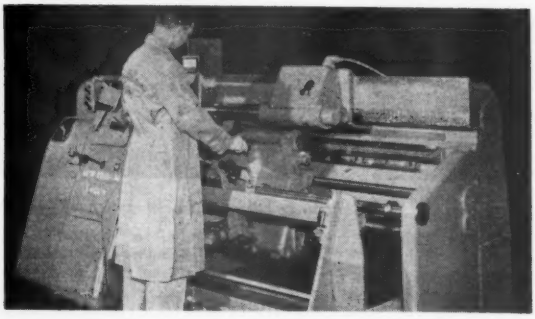
It is a completely new approach to contour turning and internal copying. In plants which can use such a machine tool even fifty percent of the time, it is probable that substantial economies can be effected in this type of turning. This will result from four principal factors: simplicity of operation, low setup and change-over time, reduced handling and checking time, and elimination of expensive form tools and multi-tool blocks.

Some of the features which contribute to these four factors deserve brief mention. There is no conventional flat bed to interfere with the flow of chips to the chip pan beneath the machine. Chips are removed through the rear of the machine without interrupting production. Location of the template on the front of the machine facilitates change-over or adjustment, and places the template in full view of the operator.

The entire hydraulic system, which features a design of the utmost simplicity, is enclosed in the carriage. Contact pressure of the tracer against the template is very light permitting the use of templates cut out of thin unhardened steel. Copying range is increased through use of a duplex tool holder, and the copying tool is supported on the whole length of the shank by a tool holder of great stability. These and other features result in unusually good surface finish, combined with dimensional accuracy.

The Fischer organization is one of the most famous European industrial pioneers and is celebrating its 150th anniversary this year. It has played a highly significant role in the industrialization of Switzerland and in building that Nation's reputation for maintaining the highest standards in precision manufacturing. In addition to many innovations along technical lines such as the origination of crucible cast steel in 1804 (a field in which Fischer is still an acknowledged world leader today), it is notable for its advanced ideas and practices in industrial relations.

A number of Fischer machines have been placed in American plants during the past year on regular production work, with all users reporting exceptionally favorable experience. Production of the new machine has already begun at the New Britain Machine Plant.



The + GF + copying lathe is a new approach to contour turning and internal copying. Its four principal features are: simplicity of operation, low setup and change-over time, reduced handling and checking time, and elimination of expensive form tools and multi-tool blocks. There is no conventional flat bed to interfere with the flow of chips to the chip pan. Chips are removed through the rear of the machine without interrupting production. Location of the template on the front of the machine facilitates change-over or adjustment, and places the template in full view of the operator. Photo courtesy New Britain Machine Co.

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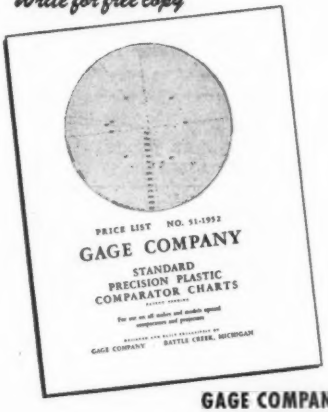

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SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

. . . **Carbide Segregation, from page 118**
throughout the other dimensions however. Table IV contains the results of this test.

Spline broach blanks 48 inches long machined from segregated and non-segregated T-1 and M-2 high speed steels were heat treated according to standard practices at three independent sources. Careful measurements were made so that the effect of segregation could be studied on the distortion characteristics. The average distortion experienced in the non-segregated T-1 steel blanks was 61.5% less than in the segregated blanks. The improvement shown by the non-segregated M-2 steel blanks was even more pronounced, the distortion being 83% less than that of similar segregated blanks.

All of these tests clearly indicate that carbide segregation definitely aggravates the distortion and warpage encountered in normal heat treatment of alloy steels.

Excessive segregation also has an influence on the machinability. It is not unusual to encounter so called "hard spots" when machining near the centers of tool steel bars. Usually these "hard spots" are attributable to clusters of hard alloy carbides rather than to improper annealing of the steel as a whole. These hard clusters chip and dull the edges of the cutting tools leading to further impaired machinability as cutting progresses.

When it is realized that agglomeration of the carbides near the center depletes the outer areas of the steel of their fair

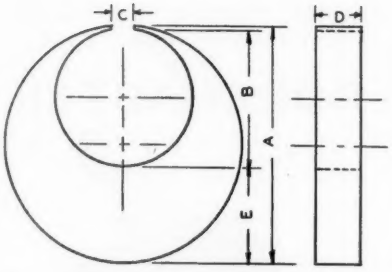

Fig. 3. Standard Navy "C" Type Distortion Ring. A = 0.5"; B = 2.0"; C = 0.5"; D = 1.0"; E = 1.9".

share of carbide particles, it is not difficult to visualize that structural variations exist across these sections. Naturally this results in non-uniform solution of the carbides during heat treatment and non-uniform abrasion resisting qualities during operation. Excessive variations in hardness across a section of a tool and die can usually be traced to macrosegregation. All too often blanking dies will show tremendous variations in production results from grind to grind. These wide divergences are due in part to carbide structural inhomogeneities from layer to layer as the die face is reground.

When the microstructures of properly heat treated samples of segregated and non-segregated similar analysis steels are examined, some of the reasons for the

(Continued on page 140)

Table III

INFLUENCE OF CARBIDE SEGREGATION IN FLAT BAR STOCK ON IMPACT STRENGTH OF M-2 HIGH SPEED STEEL

	Unnotched Izod Group E Little or No Segregation ft-lbs.	Impact Strength Group F Definite Center Segregation ft-lbs.
Longitudinal, near edge	29	30
Longitudinal, center	30	25
Transverse, break at center	31	16

Material: M-2 high speed steel, ½ inch by 3 inches flat bars, sectioned into impact test samples.

Heat Treatment: Hardened from 2250° F, 3 minutes at temperature in electric muffle furnace, oil quenched. Tempered 2 + 2 hours at 1050° F.

Intercept Grain Size: Group E — 10.4. Group F — 10.2.

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SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

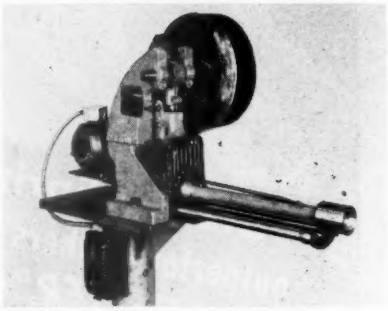
When Half a Press is Better Than One

Punch presses have long been used for the various drawing and forming operations required by the munitions industry, particularly the manufacture of various caliber shell cases. For the most part, high tonnages are required. There exists, however, many jobs in which low tonnage presses would be adequate except for the shut-height of such machines. Usually conventional presses in the 4-ton range possess approximately 8 inches shut-height—insufficient for the applications illustrated herewith.

The introduction of the "half-press" however, opens an entirely new field for manufacturers. This press consists of the upper half of the press frame, complete with ram, crankshaft, flywheel and the clutch mechanism with its trip lever. The frame is severed below a sturdy reinforcing cross brace between the two column members. This web is easily drilled for bolting the frame to a base.

The accompanying illustrations are of two typical applications. The first is a set-up for nibbling the ends of shell cases, rapidly establishing accurate length and smooth trim.

Note the sub-frame upon which the press is bolted. It consists of a casting to which a cylindrically shaped die is attached. The conversion actually amounts to a horn press.



The die is of the same approximate I.D. as the shell cases. It is equipped with a rectangular slot which is mated to the 1¼" x 1½" punch fitted in the ram.

The pilot extension supports the shell case at its outer extremity on the two small rollers. The large roller at the end of the pilot acts as a rotating stop and limits the depth of the shell case when it is slipped over the pilot.

The press ram operates continuously at 285 strokes per minute since no clutch is utilized, producing a series of fast nibbling bites. The shell is rotated by hand until a complete revolution has been made. Several hundred cases can be completed per hour and the set up is easily altered for shell case sizes from 75 to 150 mm by altering the pilot and die.

Approximately ⅛" to ⅜" of metal is

(Continued on page 142)

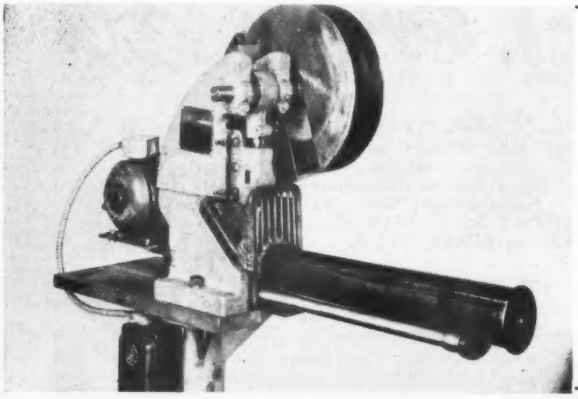


Fig. 1, left and Fig. 2, above are typical applications for the "half-press". These set ups are for nibbling the ends of shell cases thereby rapidly establishing accurate length and smooth trim. The pilot extension supports the shell case at its outer extremity on the two small rollers. The large roller at the end of the pilot acts as a rotating stop and limits the depth of the shell case when it is slipped over the pilot.
Photos courtesy Benchmaster Mfg. Co.

. . . Safe Shop, from page 117

Next is the word adequately and in front of it we place the word discuss. To discuss is to sift or examine by presenting considerations pro and con. Only when you have conveyed your thoughts to those under you so that they are fully understood have you discussed adequately.

In front of the word well, place the word supervise. To supervise is to lead, to train. To supervise well is to supervise expertly or excellently.

The next word is efficiently and alongside efficiently the word record is placed. To record efficiently means to register not only in writing, when the occasion demands, but also by making a mental note.

I have attempted to give, in these fourteen words, food for thought. I suggest that you ask yourself frequently, as I have done in the years since I first heard the subject expounded by Dr. Sappington.

Do I observe keenly? Do I reflect wisely? Do I study enough? Do I interpret properly? Do I discuss adequately? Do I supervise well? Do I record efficiently?

If we can answer these questions affirmatively or if we can honestly consider that we are making progress along the lines they suggest, I feel we can consider that we are successful safety engineers and that our program is steadily and adequately progressing to our ultimate goal—a safe press room.

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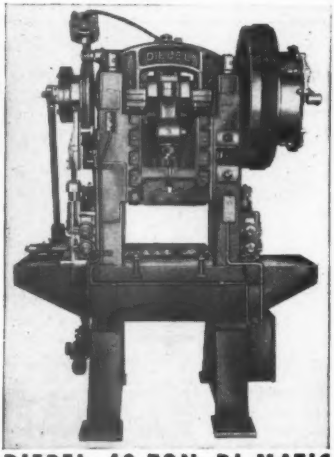

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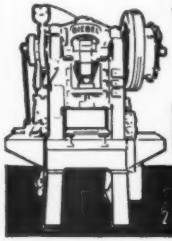

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SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

. . . Carbide Segregation, from page 136

marked influence of segregation on the physical properties become readily apparent. Figure 4 illustrates the structures found during microexamination of properly heat treated but heavily segregated M-2 high speed steel. The area shown is representative of the structure adjacent to massive segregation and contains large amounts of retained austenite and untempered martensite. If examined as quenched, a coarse and duplex grain size is apparent as well. All of the undesirable properties of these constituents—brittleness, susceptibility to grinding damage, non-uniform hardness, and varying degrees of abrasion resistance—become an inherent part of the tool or die. This condition persists even after multiple tempering and so cannot be alleviated in any manner by variations in heat treatment.

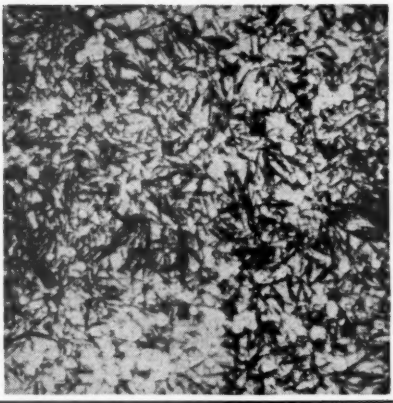

Fig. 4. Microstructure in segregated area of 3" round specimen, type M-2, high speed steel. Magnification: 600X.

Table IV

INFLUENCE OF CARBIDE SEGREGATION ON THE DIMENSIONAL STABILITY THROUGH HEAT TREATMENT OF OIL HARDENING, HIGH CARBON-HIGH CHROMIUM STEELS

Tempering Temperature °F	Hardness Rockwell C	Improvement Resulting in Freedom from Segregation* Percentage
As Quenched	65.0	13
300	63.5	18
500	60.5	26
700	59.0	15
900	57.5	3

*Measurements made on "C" dimension of Navy distortion test.

Material: 2.20% carbon, 13.00% chromium steel; 5½ inch round bar stock.

Heat Treatment: Fully annealed after machining but prior to obtaining measurements. Hardened from 1750° F, 30 minutes at temperature in controlled atmosphere furnace, oil quenched to 400° F, then air cooled to room temperature. Tempered 2 hours at temperatures indicated.

In conclusion, it can be stated that carbide segregation because of its influence on physical and mechanical properties undoubtedly exerts a tremendous effect on tool and die life. While carbide segregation was once accepted as a necessary evil in all high alloy tool steels, modern production techniques have so improved the quality of tool steels that valuable production life need not be sacrificed any longer because of these structural inhomogenities.

New Bliss Branch Office In New York

The E. W. Bliss Company, Canton, Ohio, announces the establishment of direct representation in New York City and surrounding areas with the opening of its new branch office at 50 Church Street. Mr. L. R. Hills, who has long experience with the company has been appointed District Sales Mgr. and will be in charge of the New York office. He and his staff of sales engineers will cover territory including southeastern New York State, northern New Jersey, and northeastern Pennsylvania.

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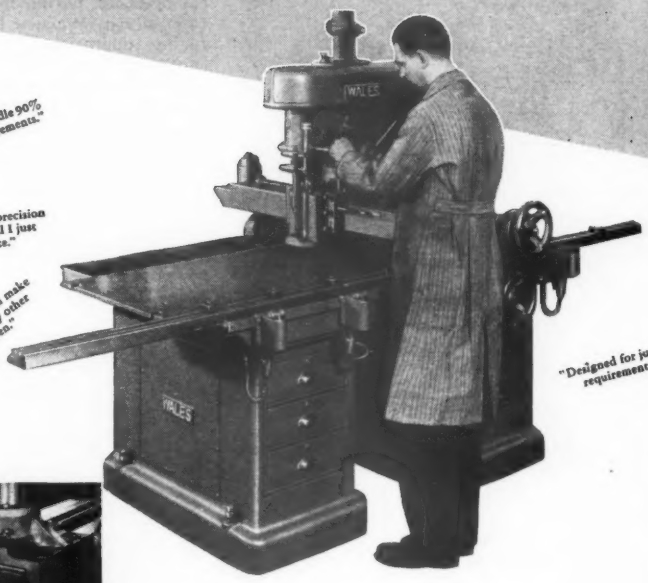

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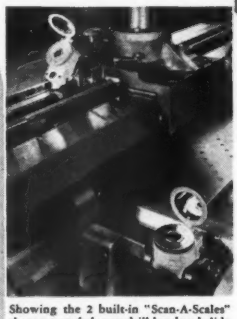
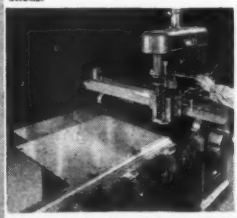


Showing the 2 built-in "Scan-A-Scales" that accurately locate drill head and slide rail for "zeroing in". Air locking clamps hold the work rigid during drilling operations.



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. . . Half a Press, from page 138

Fig. 3. This illustration shows the "half-press" converted for a sizing. The cases are manually centered under the punch by two Vee shaped fixtures and at the completion of the down stroke the finished I.D. is established.

removed, either brass or steel measuring .040" in thickness.

The second application shows a Benchmaster half-press converted for a sizing operation. Only a small tonnage is required. The problem for a small press, however, was the tremendous shut height. It has been very simply solved by securing the half-press to a T section frame. The bed is thus located 18" or more below the punch.

Shell cases come off a tapping machine at the rate of 300 per hour and are fed directly to the sizing press. The cases are manually centered under the punch by two Vee shaped fixtures, the lever tripped and the punch instantly opening up the necked-down portion of the shell case, establishing the finished I.D. The press is limited in its production by the preceding tapping process—could easily turn out almost a hundred precent more output per hour. Where a production is unhindred, a similar installation is automatically triggered by a micro-switch, contacted as the shell case is inserted in the fixtures. No manual tripping is required and cases are sized as fast as they can be fed.

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A new massive, heavy automatic vertical precision boring machine has been developed for precision boring, turning, and facing operations, and is also rugged enough for semifinishing work. Operations can be performed in a choice of versatile automatic cycles which include automatic changes in work spindle speeds.

The heavy cast-iron base supports a column on which two vertical slides are mounted. These slides are fully counterweighted and operated by large hydraulic cylinders for smooth performance. Each vertical slide carries a cross slide also powered by large hydraulic cylinders. All slide ways are hardened and precision ground.

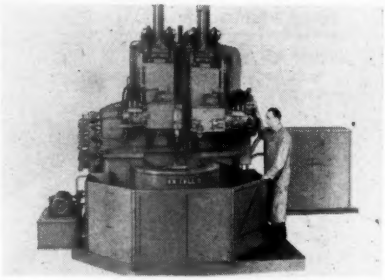

Photo courtesy Ex-Cell-O Corp.

Large parts are easily loaded on the 36-inch diameter table, which is supported on a vertical spindle. This spindle is mounted in 24-inch taper roller bearings, and driven through a precision worm at a range of speeds up to 500 rpm. This range includes speeds high enough to machine aluminum efficiently.

The dominant feature of this vertical precision boring machine, designated style 425, is its versatility. It is now being applied to multiple finishing operations on large wheels for jet aircraft engine compressors. Operations include precision boring, counterboring, chamfering, feedfacing and rabbeting.

Automatic functions of this new standard machine include all slide movements, work speed control, lubricating and coolant control.

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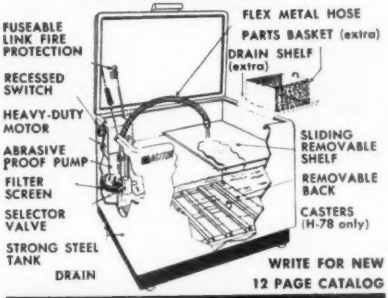

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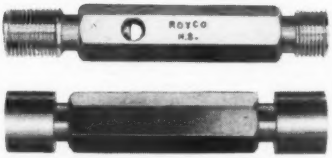

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Assure Speed and Accuracy

Proved for almost 40 years, Oliver Die Making Machines can increase the efficiency of your toolroom—save time and headaches. The Oliver Method for machine sawing, filing and lapping operations has increased toolroom efficiency and effected savings up to 60% in thousands of plants throughout the world. They are noted for their long-lasting qualities *(many Olivers have been in continuous use for more than 25 years)*, speed and accuracy, coupled with the important fact that Oliver Die Makers are so simple to operate that skilled labor is not required.

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Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

Write Today For Complete Technical Data on OLIVER DIE MAKERS

OLIVER INSTRUMENT CO.
1436 E. MAUMEE • ADRIAN, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

. . . Short Run Dies, from page 71

used. Back-up plates are used on piercing dies only, and miscellaneous standard size plates and punch holders are kept at the work area. When it is necessary to drill a back-up plate and punch holder, it should be made so future dies of the same type may be fitted to them.

No fast rule can be specified for determining when a bending die can or cannot be made from cold rolled steel. However, general die practice is to make benders from cold-rolled steel when the pressure-to-bend the piece is not great, such as bending thin sections of copper, cold-rolled steel, or other metals. Thicker sections may require the use of tool steel to keep the bender from wearing out of shape. Spring steel and hard alloy steel require tool steel for the bending die regardless of thickness.

★ ★ ★ ★ ★ ★

. . . Carbide Dies, from page 73

carbide components in these dies are Carboloy tungsten carbide Grade 55B, a high strength carbide developed to meet the requirements of blanking and piercing operations.

The blanking die in Figure 3 produces two grid plates at a time from 1/16 in. steel stock. This part is of particular significance because of the extremely thin sections required in the carbide punch. This die cost about $5,000 and was designed for a 50-ton Henry and Wright press.

The cradle blanked and pierced in the progressive die in Figure 4 is made from 0.062 in. steel stock. In addition to requiring a punch of extremely thin section, this application is noteworthy because of the two 0.072 in. holes that are produced in the part by carbide punches. A rule of thumb in steel die piercing operations is that the minimum hole diameter that can be produced is the thickness of the stock. In this case the theoretical minimum has been nearly reached.

The cradle die costs around $7,000 complete with the interchangeable spare carbide parts. It was designed to operate on a 25-ton Henry and Wright press. All the carbide punches are fully guided through a spring type stripper.

Magnetism Serves To Separate Sheet Stock

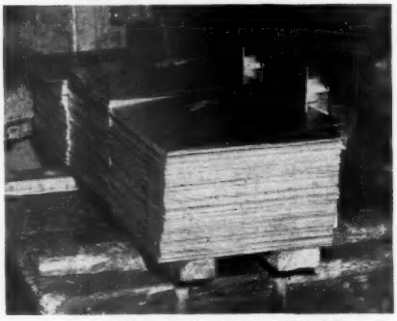


Photo courtesy Verson Allsteel Press Co.

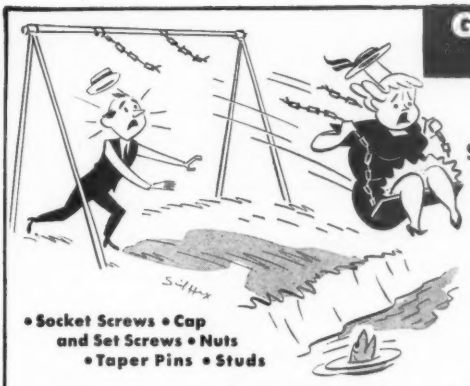
A number of manufacturers are now employing a magnetic floater for separating sheet stock. The unit is self-contained, and needs no electrical or other connections.

Permanent heavy-duty magnets are mounted on a stainless steel bracket attached to an L plate, and the stock placed beside them. Induction induced polarity causes separation of the top sheets at distances between ⅛" and ¾", depending on their width and gage.

Manifold advantages are realized. Stock may be fed more rapidly, expenses incurred by glove wear and hand injury are reduced to the minimum. Two sheets cannot be fed into the press at the same time, and the danger of damage to dies eliminated. Irregular shaped sheets are handled more quickly. One company has had the welcome experience of being able to release for more productive work a man whose sole function had been to separate sheets of stock with a screwdriver and hand them to the press operator.

The efficiency of the device is not affected by condition of the stock. It performs even if the stacked steel blanks have nested, and are burred and oily. The top sheet is removed, and immediately others fan out below it.

DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Penna.



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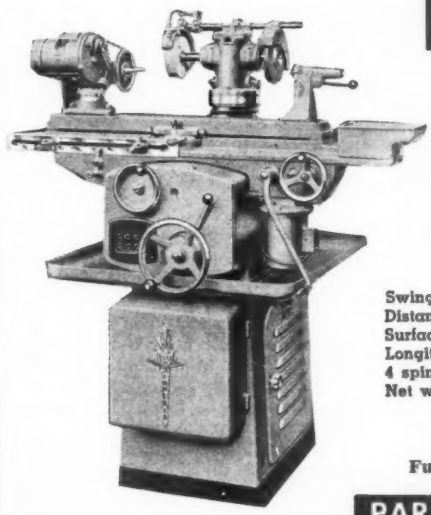

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Swing over table	10"
Distance between centers	20"
Surface of table	5"x32"
Longitudinal movement	13¾"
4 spindle speeds, RPM	2900 to 5800
Net weight	1,500 lbs.

IMMEDIATE DELIVERY

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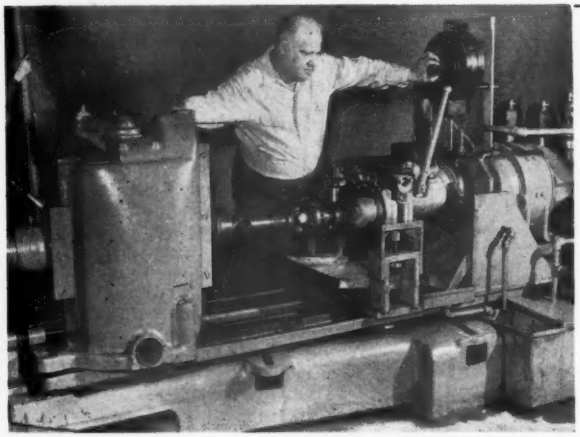
SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

. . . Quiet Gears, from page 78

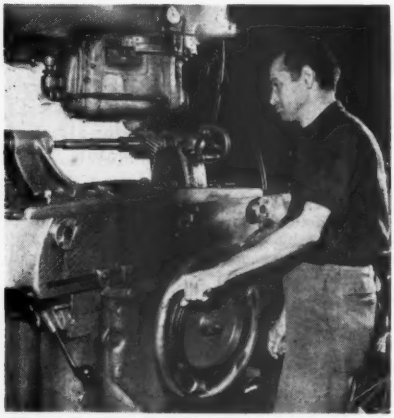


★

Left. Production test stand for inspection for reverse and reduction gear assemblies. These units are operated under a schedule similating service conditions.

★

No. teeth	23
DP	7
NP	7.7278 in.
Diametral PA	20 deg
PD	3.2857 in.
Full depth	0.308 in.
Addendum	0.132 in.
Helix Angle	25 deg., 4 min
Spiral	RH
Lead	22.0695 in.



Red Ring gear finisher with guards removed to show shaving of the internal ring gear.

Backlash with mating gear is held to 0.004-0.006 in., provision for adjusting backlash being made in the housing by virtue of an eccentric pilot.

The mating internal ring gear, on the other hand, is machined from a steel forging, the forging being heat treated before machining. Internal gear teeth are cut on Fellows gear shapers, then shaved in another Red Ring gear finisher tooled for the purpose. Gear data for a typical ring gear—2.565 to 1 ratio—are listed below:

No. teeth	59
DP	7
Diametral PA	20 deg
PD	8.4286 in.
Full depth	0.232 in.
Addendum	0.062 in.
Helix angle (RH)	25 deg. 4 min

In initial machining the inside diameter is held to 8.303-8.307 in. The center bore, for piloting, is held to 5.813-5.814 in. after finish grinding, and is held square with the axis to assure alignment at assembly.

Naturally the production of gear sets as well as reduction gear assemblies is done on a job-lot basis, using the same equipment for the various parts.

Since quality control is of major importance, this division has in operation a modern gear laboratory fitted with inspection equipment of the latest type. Among other equipment there is an

(Continued on page 150)

Elgin DIAL INDICATOR

A multi-purpose indicator that excels in precision, versatility and ruggedness. Only 3" in length. Exclusive Deep Hole and Micro-Hole Gauge accessories. Surprisingly low in price.

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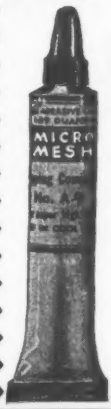

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PROBLEMS

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3/32 to 3/8 by 32nds $1.40
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● This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

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Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	6	6½	23

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MEADVILLE • PENNSYLVANIA

New Red Ring Stock Divider for Gears

In setting up a gear preparatory to grinding it is necessary to know precisely how much eccentricity it has and to locate the high point on the pitch circle. Then it can be properly clamped on its arbor so that an equal amount of stock on each side of the high point will be presented to the grinding wheel.

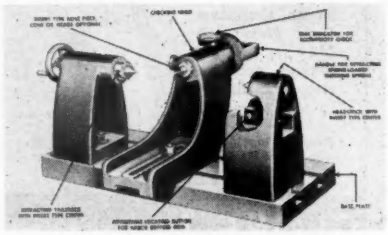


Photo courtesy National Broach & Machine Co.

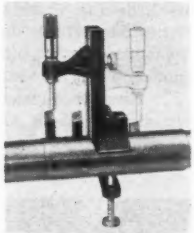
This operation may, of course, be performed on the gear grinding machine, but the time required for it is unproductive machine time. The stock divider just announced eliminates this loss by allowing the machine operator to clamp each gear on its arbor while its predecessor is being ground. Thus the only down time for the grinder is that required to unload the finished gear and immediately load the next.

The stock divider, usually located on a bench in the vicinity of the grinder consists of movable head and tailstocks and a checking head adjustable to work gear diameter. The latter has a removable nose piece and a spring-loaded spindle which actuates a dial indicator for reading gear eccentricity. This spindle may be locked with the nose piece either in or out of contact with the work gear teeth.

The arbor carrying the work gear is set between the stock divider centers and the arbor driving dog in contact with the adjustable locating button (see illustration). In most cases the work gear rotating on its arbor is then checked for eccentricity at several points around its circumference by means of the nose piece and dial indicator.

SAVE TIME

With Bartelt Gages



• Use a Bartelt Pedestal Micrometer for setting boring tools and for many other shop operations requiring accurate positioning relative to a fixed base. Make settings in one step—eliminate cut-and-try-methods. Model B, with reversible slide, shown. *Write for literature describing all models.*

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Here's a drill press that will save you time and produce finer work. With this machine you don't have to stop the motor to change spindle speeds. You don't have to bother with belts, belt covers, and slow-speed attachments. You can work with the correct speed and minimize scrapped work.

Speeds of 150 to 4000 RPM Available at Fingertip

You merely set the pointer of the dial to the correct spindle speed and go to work. Adjustment can be made during actual operation to obtain efficient cutting or eliminate chatter.

FREE DATA on this outstanding new drill press will be sent upon request. Ask for Bulletin TP-4.

The ELECTRO-MECHANO Co.
260 EAST ERIE STREET
MILWAUKEE 2, WISCONSIN

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

. . . Quiet Gears, from page 146

technique is used in finishing the drive pinion as well as the camshaft gear in the timing train. This procedure combines to eliminate noise as well as edge loading due to the deflection of shafts and other causes for misalignment under severe operating conditions. This, in turn, is responsible for an enormous improvement in durability and makes possible the use of smaller gear sets.

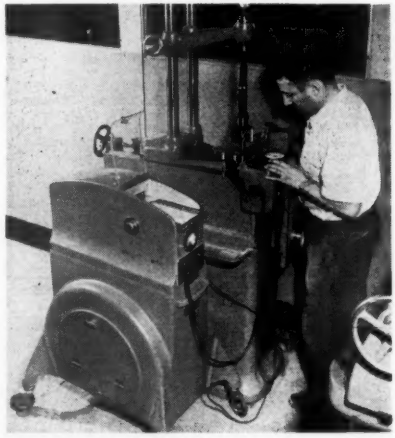
The range of gear ratios made available, together with the center distance of input and output shafts in each case, are shown in the following tabulation. It may be noted that Chrysler has made it a practice to avoid even ratios in the interest of further reducing noise level.

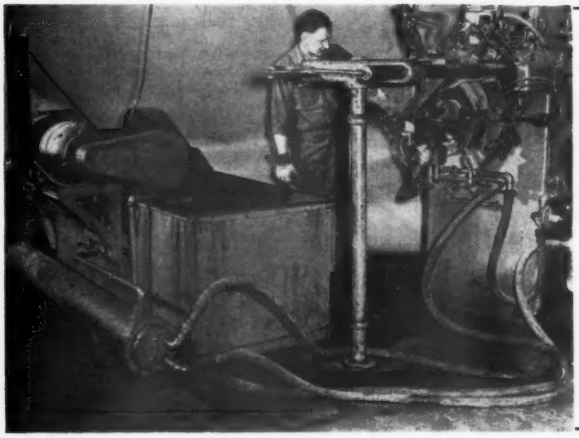
Ratio	Center Distance (in.)
1.434 to 1	23/32
2.043 to 1	1 23/32
2.565 to 1	2 9/16
3.17 to 1	3 9/16
3.958 to 1	4 27/32

Turning to the design data and fabrication of the gear set, the drive pinion is of helical type with a face width of two-in. and OD of 3.545-3.550 in. Gear cutting is done in two separate operations—rough hobbing in Barber-Colman hobbing machines; Elliptoid crown-shaving in the Red Ring gear finisher. Because of the generous face width the crown shaving operation reduces the tooth thickness by 0.001 in. at each end.

It is of interest that the entire pinion shaft is hardened and drawn to a Brinell hardness of 250 before hobbing and crown shaving. Following crown shaving the gear teeth are flame-hardened in a Fellows flame-hardening machine. Gear teeth are flame-hardened to a depth of 0.060-0.080 in. measured at the pitch line. The work is quenched in oil and drawn at about 350 F. Final hardness of gear teeth is approximately 55-58 Rc. Condensed data on the pinion are given on page 168.

(Continued on page 168)





Above. View in gear laboratory. This shows the Illinois involute checker with the chart recorder cabinet at the left.

★

Left. Drive gear teeth are flame hardened to a depth of 0.060-0.080 in. in this Fellows machine.

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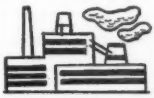

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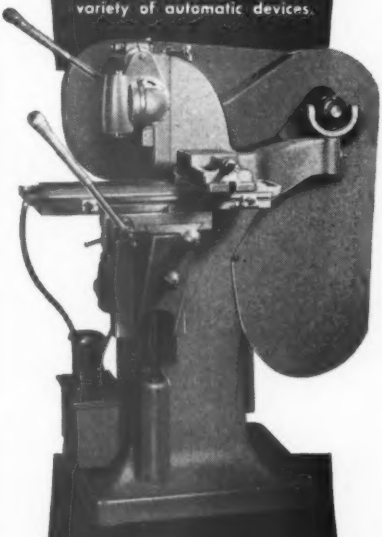

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SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

PUBLICATION

Keep Informed! CATALOGS • BULLETINS • SPECIFICATIONS

Information and Practical Applications of modern technique in second operation internal chucking are included in a catalog published by Speedgrip Chuck Inc., 822 N. Ward St., Elkhart, Indiana. The Speedgrip Chuck is designed for close tolerance production work, and does away with the need for costly special fixtures.
Circle Inform-A-Gram No. B1.

A New Catalog, D110, illustrates and describes the C-O Cincinnati 14"-3000 sliding head floor drill. The drill is fitted with an exclusive tilting motor bracket for easy changes, six spindle speeds being provided. For details write to the Cincinnati Lathe & Tool Co., Canedy-Otto Division, Oakley, Cincinnati 9, Ohio.
Circle Inform-A-Gram No. B2.

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THE FEDERAL PRESS CO.
807 Division St., Elkhart, Ind.

New Hercules Presses are included in a catalog from Parker Machine Co. The presses are of all steel welded construction, and are built in a variety of types and sizes. The catalog also includes details of many other types of shop machinery. Parker Machine Co., Inc., 158 Pioneer Street, Brooklyn 31, New York.
Circle Inform-A-Gram No. B3.

The Ziv Steel and Wire Co., 2945 W. Harrison St., Chicago, Illinois have issued a comprehensive catalog of their range of tool steels. Included are useful sections on heat-treat practice and standards.
Circle Inform-A-Gram No. B4.

A 64-Page Catalog of Equipment for Maintenance, Safety, and Production presents a complete line of rotary shaft units, rotary files and burs, metal slitting and slotting saws, a complete line of electrical motor maintenance items, electric etching equipment, and numerous other lines. Catalog is an excellent buying aid for the Maintenance Superintendent in particular. THE MARTINDALE ELECTRIC CO., Box 617, Edgewater Sta., Cleveland 7.
Circle Inform-A-Gram No. B5.

Medium Duty Welding Positioners are illustrated in new catalog sheet No. 79. Variable speed table rotation is electrically powered and controlled. Variable speed transmission, with 10:1 ratio, has built-in, totally enclosed worm gear reducer. Table tilt system is manually operated on standard units; however, electric power tilting is optional. Rugged, all-steel welded construction makes it an ideal fixture for heavy production work. REED ENGINEERING CO., Carthage, Mo.
Circle Inform-A-Gram No. B6.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

Examples of Some of Their 5,000 Switches designed for industry are described in a catalog from the Micro-Switch division of Minneapolis-Honeywell Regulator Co., Freeport, Illinois. Write for form A88-44.
Circle Inform-A-Gram No. B7.

High Stacking of Skids and Bins can be readily accomplished using the new telescopic high-lift platform "Worksaver", a powered hand truck. With a 4000-lb. capacity, this truck has a lowered platform height of only 6-½", lifting loads up to as high as 126-½". Articulated frame permits continuous floor contact of drive wheels and load, despite ramps and floor variations. Request literature from THE YALE & TOWNE MFG. CO., Philadelphia 15, Pa.
Circle Inform-A-Gram No. B8.

Bright Annealing, Hardening, and Brazing of stainless steel and other metals by continuous production methods is now possible with conveyor-type industrial furnace, which incorporates ammonia dissociator assembly. Unit has established phenomenal records for bright annealing of stainless steel stampings, and usually eliminates pickling acids, sand blasting, and polishing. SARGEANT & WILBUR, INC., 180 Weeden St., Pawtucket, R. I.
Circle Inform-A-Gram No. B9.

Milford Band and Profile Saw Blades are listed in a bulletin obtainable from the Henry G. Thompson and Son Co., New Haven 5, Connecticut. The profile saw permits machinists to make cuts that ordinarily must be performed on a shaper, lathe, or drill press. The bulletin also contains a chart of cutting and blade recommendations for different work.
Circle Inform-A-Gram No. B10.

Fast Knurling Operations without troublesome setups can be made with Handy Knurler. Work can be rotated in the lathe or drill press, or clamped in the vice or held in the hand. Send for a folder illustrating some of the many uses of this inexpensive tool to the M.P.A. Co., 1678 W. 17th Place, Los Angeles 6, California.
Circle Inform-A-Gram No. B11.

Automatic Precision Stamping Equipment Service is offered in a new brochure from the Detroit Stamping Co., 34 Midland Ave., Detroit 3, Michigan. The company facilities are detailed, and enquiries invited. Proper application of the multiple stamping technique has resulted in savings of up to 75% in manufacturing costs.
Circle Inform-A-Gram No. B12.

More Lathe Output

PER MAN-HOUR!
PER MACHINE!

Easy with
IDEAL Live Centers
for light or heavy turning

Make deeper cuts at faster speeds . . . No gouging or burning . . . No spoilage or rework . . . Precision-built for micrometer accuracy. "Multi-Duty" Models available with male, female and pipe points. "Heavy-Duty" Models for BIG jobs. All standard sizes.

Sold Through Leading Distributors

"TURNS WITH THE WORK"

Mail- FOR FULL DETAILS

IDEAL INDUSTRIES, Inc. (IDEAL)
4151 Park Avenue, Sycamore, Illinois
Please rush catalog information on IDEAL Live Centers
NAME
COMPANY
ADDRESS
CITY ZONE STATE

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

Details of Six Models of Fast-Grip Toggle Clamps are given in a catalog sheet from the Robert J. Kelly Mfg. Co., Box 61 Broadway Sta., Newport, R. I. These clamps feature fast adjustment and quick one-hand release, and the range covers all shop clamping needs.
Circle Inform-A-Gram No. B13.

TAC Open End Ratchet Wrenches are described in a folder from Tubing Appliance Co., 10321 Anza Ave., Los Angeles, Cal. The wrenches are made in both socket and crowfoot types.
Circle Inform-A-Gram No. B14.

A New Catalog of Standard Mold Bases and Moldmakers' Supplies has been issued by the Detroit Mold Engineering Co. Containing 143 pages, this catalog supersedes previous issues, and contains a wealth of information for moldmakers and designers. New additions to the catalog include data on the 13⅜" x 23½" series of Mold Bases, Retainer Sets and Mold Plates, a complete listing of extra-thick mold plates for all series, information on a reflectoscope service. The Detroit Mold Engineering Co., 6686 E. McNichols Rd., Detroit 12,
Circle Inform-A-Gram No. B15.

There's a reason 71%*

of all popularly-priced Tool and Cutter Grinders sold in 1951 were "Knock-Outs"

MODEL B860

Will do anything that machines costing 2 or 3 times more will do . . . yes and in less time.

Distributed Only Through Franchise Dealers

K. O. LEE CO.
ABERDEEN, S. D.

*BASED ON NATIONAL MACHINE TOOL BUILDER'S ASSOCIATION REPORT

Three-Dimensional Magnification, with stereoscopic wide-field microscopes, is finding increasingly wider application in the field of quality control, precision assembly and fitting operations on small parts, and for control of finishes and specifications on microscopic tools and dies. New informative 20-page brochure emphasizes dust-proof features, versatility, and clarity of images obtained with these Stereomicroscopes. BAUSCH & LOMB OPTICAL CO., 635 St. Paul St., Rochester 2, N. Y.
Circle Inform-A-Gram No. B16.

Versatile Benchmaster Presses are described in bulletin available from the manufacturer. Models illustrated are the 1-ton midget punch press designed for replacement of manual presses with high speed operation—up to 290 strokes/min.; 4-ton standard punch press; 4-ton deep throat punch press; and 7½-ton punch press. All are OBI design, motor-driven, quickly converted to continuous feed, and intended for use with standard die sets. BENCHMASTER MFG. CO., 1835 W. Rosecrans Ave., Gardena, Cal.
Circle Inform-A-Gram No. B17.

Extra Long Workpieces, such as electric motor shafts, can be accurately cut from bar stock on Tavannes automatic single-spindle lathe with traveling headstock. Several size models are available. By proper selection of headstock and accessories, workpiece lengths up to 21⅝" have been successfully machined, and bar stock up to 2⅜" dia. has been worked. As many as 12 independent tools may be used. Stationary spindles on turret can be replaced with (6) rotating spindles for drilling and other operations. Central forced lubrication, copying device, "idle" time accelerator, prismatic head stock construction and other details are highlighted in Bul. TMC-319, available from importers RUSSELL, HOLBROOK & HENDERSON, INC., 292 Madison Ave., New York 17.
Circle Inform-A-Gram No. B18.

Six-Spindle Vertical Lathe, for automatic high production of precision components, is available in several bar type and chucking models of various capacities. Among many features are absolute independence of the 6 slides and 6 bottom tool barrels, unlimited tooling combinations, accelerator device for reduced nonproductive time, simplicity of attendance, positive drive of bar stock, coolant system for copious spray of all cutting tools, and many others. The Tavannes "Gyromatic" for chucking operations provides either pneumatic or hydraulic clamping of automatically loaded components or hand loading of complicated shapes. For Bul. TMC-326, write RUSSELL, HOLBROOK & HENDERSON, INC., 292 Madison Ave., New York 17.
Circle Inform-A-Gram No. B30.

Kaukana Universal and Horizontal Drilling and Tapping Machines are covered in a new 12 page catalog. These machines have 360° column swivel with vertical travel on the column and universal head positioning. They are capable of vertical, angular, compound angular and horizontal drilling, tapping, boring, spotfacing and reaming on workpieces of any size and shape. All models are available with extended runway and column travel for extremely large work. For catalog and detailed information, write Kaukana Machine Corp., Kaukana, Wisconsin.
Circle Inform-A-Gram No. B31.

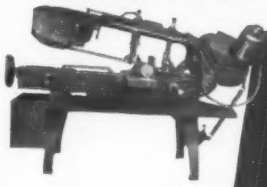
Time Loss, Inaccuracies, and Marred Surfaces often attributable to press fit methods of assembly can be eliminated in many instances through use of shrink fit methods, which provide greater gripping pressures. The Miskella Infra-Red Shrinker permits fast, safe, controlled fits. Pre-lubricated bearings and other parts can be heated without loss of lubricating properties. THE MISKELLA INFRA-RED CO., E. 73rd and Grand, Cleveland 4, Ohio.
Circle Inform-A-Gram No. B32.

The ℵ12M Vertical Profiler and Milling Machine, made by Morey Machinery, has been newly redesigned and improved. The ℵ12M is still designed for fast duplication of small parts requiring accurate interchangeability, but now has a vibrationless spindle with splines instead of keyways, and backlash at the control has been completely eliminated. Copies of the fully illustrated brochure from Morey Machinery Co., Inc., 410 Broome Street, New York 13, New York.
Circle Inform-A-Gram No. B33.

A Mechanical Method of Locking Tool Tips is featured in a new bulletin from the American Cutter and Engineering Corp. of Warren, Michigan. Incorporated in the "Boylock Cutter", this device eliminates the strain set up in brazing high speed, carbide or cast metal tips to a body or shank having a different coefficient of expansion. The bulletin also gives information on a wide range of special cutting tools that can be made to customer specifications.
Circle Inform-A-Gram No. B34.

5 BIG REASONS

Why Wells Band Saws slash metal cut-off costs



1. Fast, Accurate Action
2. High Job Productivity
3. Low Operating Cost
4. Real Blade Efficiency
5. Long, Dependable Service

Above is the Wells No. 8, shown with wet cutting system. It offers a capacity of 8" x 16", rectangular, 8" dia., rounds.

YOU are always ahead when you handle your cut-off jobs on "Wellsaws." The Wells Band Sawing method will not only reduce your operating costs, but also give you greater job efficiency — better cuts, and real dependable service. There is a size and type for every need and every budget. Capacities range from 3½" x 6" to 48" x 48". Write for descriptive literature.

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
1040 CEDAR ST., THREE RIVERS, MICH.

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

Blue Magic Chemical Specialities Co., 2135 Margaret Street, Philadelphia 24, Pa., have issued a new illustrated catalog on Barrel Finishing Compounds. Amongst the applications of these compounds are deburring, polishing, cleaning, and burnishing. The company also offers laboratory facilities for trial runs and working samples for tests.
Circle Inform-A-Gram No. B35.

Complete Selection, Price, and Shipping Data for industrial fasteners are given in a new catalog from Connecticut Screw & Rivet Co., Waterbury 20, Connecticut. Slotted and Phillips screws and tapping screws, in both steel and brass, steel stove bolts and plating extras are all included in easy-to-find sections.
Circle Inform-A-Gram No. B36.

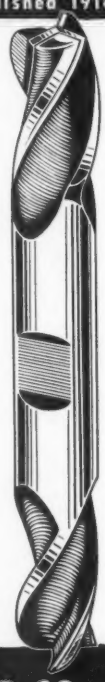
Bulletin 5202 Features South Bend 13" Swing Lathes, together with attachments and descriptions of other South Bend toolroom machinery. The bulletin details standard equipment for the 13" lathe, and lists features and specifications. Write South Bend Lathe Works, 425 E. Madison St., South Bend 22, Indiana.
Circle Inform-A-Gram No. B37.

ARROW TOOL & REAMER CO., Established 1916

ARROW
END MILLS
A COMPLETE LINE

Arrow's engineering skill and production experience gained during 36 years as a major supplier of precision tooling is your assurance of custom quality, prompt service and superior performance.

Write today for details on Arrow's simplified fast service on "Specials"



ARROW TOOL & REAMER CO.
418-422 LIVERNOIS AVE. • DETROIT 9, MICH.

The Manufacture of forming and drawing dies, spinning chucks and tips, and industrial table-tops, are among the uses of densified wood listed in bulletin 551 available from Parkwood Laminates Inc., 24 Water Street, Wakefield, Mass. The bulletin also includes a complete list of the grades of the material available.
Circle Inform-A-Gram No. B38.

Applicability of Four Classes of Hobs is discussed in new Bulletin H-52. New "Michigan Process" Hobs, which are unground but manufactured to high standard of accuracy and surface quality, are offered as a means of reducing costs of gear manufacture where tolerances permit. Bulletin includes a highly useful table of tolerances for the various types of hobs as a guide to their proper selection and application. MICHIGAN TOOL CO., 7171 E. McNichols Rd., Detroit 12.
Circle Inform-A-Gram No. B39.

Many Intermediate and Finishing Operations can usually be eliminated by using "Enamelstrip" pre-coated and pre-colored coil stock—cold rolled steel, electro-galvanized steel, electrolyte tin plate, brass, zinc, and aluminum—for stamping and forming. Stock is available in a wide range of synthetic enamel, chemical, and other finishes. A folder will be sent upon request, by THE COATED COIL CORP., 539 W. 30th St., New York 1.
Circle Inform-A-Gram No. B40.

The Control of Industrial Dust is described in a Bulletin No. 909A from Pangborn. The booklet features the Pangborn "CH" system of control which utilizes cloth filters for the collection of finely divided dry dusts. A characteristic of this system is high recovery at low cost. All elements of the system are described, and application and engineering data and tables also given. For details apply to the Pangborn Corp., Hagerstown, Maryland.
Circle Inform-A-Gram No. B41.

The Bellows Pneumatic Drill Press Feed is completely described and illustrated in a bulletin DF-110 from the Bellows Co., 222 West Market Street, Akron, Ohio. Besides dimensional drawings and specification data, the bulletin contains wiring diagrams and electrical hook-ups for combining the Bellows drill press feed with other Bellows pneumatic devices.

Circle Inform-A-Gram No. B42.

Precise Finishing of Holes is economically achieved by pneumatic grinding heads, operable at high speeds . . . up to 100,000 rpm. Air-lubricated bearings eliminate frequent maintenance. Spindle floats on air under pressure and runs cool even at highest speeds. Drive is obtained from air-turbine runner fitted to the spindle. Two units provide entire wide speed range of 35,000 to 100,000 rpm. For Circular No. 547, write PRATT & WHITNEY, West Hartford 1, Conn.

Circle Inform-A-Gram No. B43.

A Titanium Carbide Thread Ring Gage is described and illustrated in current literature from the Pipe Machinery Co., 930 E. Seventieth Street, Cleveland 3. Gages from this line are non-adjustable and almost completely fool-proof, and have phenominal wear-life. Examples have yet to show measurable wear after four years production and assembly line work.

Circle Inform-A-Gram No. B44.

Collection of Data Sheets is available covering the construction, operation, and application of numerous automatic air-operated fixtures for drilling, tapping, and threading. These include clamping devices, dial indexing fixtures, electrically and manually controlled units. Basic units are designed for widest range of jobs, save major expense of special tooling, are easily tooled for specific workpiece holding. SNOW MFG. CO., 435 Eastern Ave., Bellwood, Ill.

Circle Inform-A-Gram No. B45.

A 28 Page Tool Steel Stock List is available from the Uddeholm Co. of America, Inc., 155 E. 44th Street, New York 17, New York. In addition to a complete listing of tool and die steels, the booklet contains a table of standard gages and information on specialty strip steels.

Circle Inform-A-Gram No. B46.

Continuous Blast Cleaning is explained in a new bulletin from the American Wheelabrator and Equipment Corp. The work progresses in an uninterrupted flow through the machine, no stoppages for loading and unloading being necessary. The process is of particular interest where large tonnages have to be cleaned on a production line basis. Bulletin 844, American Wheelabrator and Equipment Corp., 1183 S. Byrkit St., Mishawaka, Ind.

Circle Inform-A-Gram No. B47.

A Case History of Increased Production with the use of Natco multiple spindle drilling and tapping machinery is the subject of a new folder from National Automatic Tool Co., Richmond, Indiana. Typical applications of both vertical and horizontal Natco machinery are instanced.

Circle Inform-A-Gram No. B48.

benchmaster
ECONOMY
PROVED AGAIN!
5
Benchmasters
COST LESS
THAN 1!
One operator used his Benchmaster press for all 5 stages of a forming operation. Die changes and set-ups proved costly—both in time and lost production. NOW —5 Benchmasters do the same job, each handling a separate stage. Tooling is never changed or removed. Savings in time and extra output have paid off the entire cost and continue to pay a high dividend on a low investment!
There's a low-cost Benchmaster for every requirement—1 Ton, 4 Ton, 7½ Ton and Deep Throat models. Write for literature or see your dealer.
benchmaster
PUNCH PRESSES AND MILLERS
1835 W. Rosecrans Ave.
Gardena, California
World's largest manufacturer of small punch presses and milling machines.

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

Bay State Abrasive Products Co., 1 Union St., Westboro, Mass., offer expert advice on segmental grinding problems. Send for informative folder which includes such developments as fractional hardness grades, and new abrasive compounds for better cutting.
Circle Inform-A-Gram No. B49.

Data Sheets Covering Ring Punches and Dies are available from the Ring Punch & Die Co., 108 Foote Ave., Jamestown, New York. Button dies are available in either ring type or press fit, and feature hole taper to avoid jamming of the slug. Punches are precision made of both carbon vanadium and high carbon, high chrome steels, and are available in a wide range of stock sizes, from 1/32" to 1" point diameters in increments of 1/64".
Circle Inform-A-Gram No. B50.

A New Brush Bulletin From Mill-Rose Co., 1985 E. 59th St., Cleveland 3, Ohio, lists for the first time 56 standard Mill-Rose precision-made wire brushes in the sizes found most useful by industry. The bulletin is intended to eliminate the nuisance of "specials" with attendant shipping delays and high prices.
Circle Inform-A-Gram No. B51.

SAVE UP TO 85% ON TOOLS-MACHINERY AND PARTS!!
1952-230 PG. CATALOG
Our latest & biggest CATALOG of NEW and SURPLUS BARGAINS. Thousands of items at UNHEARD OF LOW PRICES! SAVINGS UP TO 85% in Hand & Power Tools, Electrical Supplies, Industrial Machinery, Gas & Electric Motors, Winches, Hoists, Machine Tools, Gauges, Welding Equipment, Pneumatic & Air Tools, Raw Stocks, Aluminum, Brass, Copper & Steel in Sheets, Bars, Rods, Tube & Extrusions, Nuts, Bolts, Rivets, Screws, Wire, Cable & a Huge Stock of HYDRAULIC SUPPLIES including Cylinders, Valves, Pumps, Motors, Fittings, Tubing, etc. While these items last we will continue to sell them at typical low Palley Prices. WRITE TODAY FOR YOUR COPY!
WAR SURPLUS SAVINGS
Stationary or Portable ARC WELDER
97.50
Delivers 300 Amps., continuous — or 350 to 400 Amps., intermittent
Designed to weld continuously for hours . . . This unit is built around a rugged, heavy duty, aircraft type generator and comes complete with pulley reactor, output controls, switches and & rheostat mounted on sturdy steel frame. Operates on 15 H.P. for maximum output. Gas or electric motor. For light or heavy industrial work.
HYDRAULIC PUMP & CYLINDER SPECIALS
Hyd. Variable Displacement PUMP
Will deliver maximum volume at any pressure setting between 600 and 900 P.S.I. Pump housing serves as reservoir for system. Has built-in compressed air super-charger which makes system independent of outside atmospheric pressure. Rotation is left hand only. Maximum speed for continuous duty is 3750 R.P.M. Displacement is .484 cu. in. per revolution, or approximately 4 G.P.M. at 1750 R.P.M.
32.50
Special! HYDRAULIC CYLINDER
Gives 20,000 lb. thrust (push or pull) using 1500 PSI line pressure as obtained from our hydraulic pumps. Will produce up to 40,000 lb. thrust with 3000 PSI. Can also be used on low pressure air systems. 4" bore; 18" stroke; 30½" length. Ideal for road-farm — shop machinery, etc.
29.95
P-3 STRATO POWER PUMP
With built-in variable flow control valve in head. Positive displacement piston type. Displacement capacity: 2 gal. per min. at 1500 RPM at 1250 PSI. Pressure limit 1250 PSI continuous. 1400 PSI for 15 sec. Operates at 3750 RPM, intermittent max. 4500 RPM. Rotates either direction without adjustment . .
19.50
No. 3 HYDRAULIC CYLINDER
Double action. Bore is 1" — Shaft ½". Has stroke of 2½" to 4". Stroke can be adjusted with internal sleeve stops. Overall length is 8½". Will take 1500 lbs. continuous duty. 3000 lbs. intermittent. Will lift or push up to 1100 lbs.
5.75
P-4 VICKERS ANGLE PUMP
Positive displacement type, angle piston. Displaces .507 cu. in. per revolution. Has capacity of 6 gal. per min. at 3000 RPM or 1500 PSI, continuous, 1875 for 15 sec. Operating speed of 3750 RPM, intermittent maximum, 4500 RPM. Rotates to the right only.
19.99
FOUR WAY VALVE
Poppet type. Pressure balanced. Off at neutral position. Piston type with built-in relief valves for limit of cylinder strokes. 5/8" AN tube size (7/8"-14 thread) inlet & outlet. Ports to cylinder are 1/2" AN tube size 3/4"-16 thread).
9.75
PALLEY SUPPLY CO.
DEPT. TD-8
6321 SAN FERNANDO RD.
GLENDALE 1, CALIF.
Order from this ad. All sales final. All prices F.O.B., Glendale. Pay by M.O. or check. P.O.'s accepted from D.&B. firms. ½ deposit with C.O.D.'s.

An Automatic Universal Flute Grinder is detailed in a catalog sheet from Wardwell Mfg. Co. Called the 90-FS, the machine will grind spiral flutes from solid in drills as small as 1/16" in diameter, spiral or straight taper reamers, and spiral or straight milling cutters and end mills. Full details from Wardwell Mfg. Co., 3167 Fulton Rd., Cleveland.
Circle Inform-A-Gram No. B52.

A Complete Line of Coolant Filtration and oil handling equipment is presented in a bulletin from Honan-Crane Corp., 208 Indpls. Ave., Lebanon, Indiana. The bulletin covers equipment for all machine tools and metal working operations. Also described is Honan-Crane's engineering service, which includes the design, construction and installation of complete filtration and purification systems for coolants and lubricants.
Circle Inform-A-Gram No. B53.

A New 4 Ton Punch Press is described in a catalog sheet from the Kenco Mfg. Co., 5211 Anaheim-Telegraph Road, Los Angeles 22, California. This press, called the 4-in-1 Standard, can be converted into a long type, horn, or half punch press by making a few simple adjustments. The trip mechanism may be changed from single to repeat operation without stopping the motor, and a patented clutch drive dog is built into the clutch collar for extra performance.
Circle Inform-A-Gram No. B54.

A Hydraulic Overload Pitman is described in current literature from the Dayton Rogers Co. The pitman gives ram pressure uniformity and safety together with high production. It eliminates danger of damage to punch press crank and frame, and assures constant ram pressure regardless of stock thickness variation. Dayton Rogers Mfg. Co., 2824 13th Ave. S., Minneapolis 7, Minnesota.
Circle Inform-A-Gram No. B55.

Chatterless Countersinking of round or square holes, chamfering and burring, valve-seat finishing, center reaming are all done with one basic tool—the new "Quad" countersink. Developed to produce controlled finishes with none of the secondary burrs resulting from flute designs of conventional tools, this tool is offered in a range of popular sizes with included angle of 60°, 82°, or 90°. For Catalog Sheet HS-110, write to M. A. FORD MFG. CO., Inc., 732 W. River St., Davenport, Ia.

Circle Inform-A-Gram No. B56.

A New Air Valve Catalog is offered by Rivett Lathe and Grinder Inc., Brighton 35, Boston, Mass. This twelve page two-tone production illustrates and describes 19 different models. Everything possible has been done to facilttate layout of air circuits by the design engineer. Valves are shown in hand, foot, solenoid, cam, and pilot types. Write to Rivett for Section 303.

Circle Inform-A-Gram No. B57.

Automatic Roll Feeds are described in a catalog sheet from the manufacturer. Features of these units include easily adjustable feed, and a design permitting mounting on the press in any position. Several of the units can be mounted on one press, to feed different stocks simultaneously in the lengths required. Write for catalog "A" to La Bahn Machine & Mfg. Co., Metuchen, New Jersey.

Circle Inform-A-Gram No. B58.

Versatile Milling is offered by Werner No. 3 universal, vertical, and plain millers, which feature automatic feed in six directions, with automatic intermittent rapid traverse longitudinally. Principal working parts are automatically lubricated. Construction is rugged. Obtain descriptive bulletin by writing to MARAC MACHINERY CORP., 1819 Broadway, New York 23.

Circle Inform-A-Gram No. B59.

A Catalog from Severance Tool Industries Inc., 730 Iowa St., Saginaw, Mich., features Set No. 77 of Severance High Speed Midget Mills, and gives details of the Severance tool regrinding service. Also included is a full range of ¼" shank-size cutters.

Circle Inform-A-Gram No. B60.

The "Zip-Grip" Self-Locking Principle for set-screws is clarified in a demonstrator model available from the Set Screw & Mfg. Co. Unlike conventional set-screws, Zip-Grip does not rely on interference against the shaft, but upon a special interference fit of the back threads. This ensures complete locking without the possibility of damaging the shaft. Set Screw & Mfg. Co., 2600 Main St., Bartlett, Ill.

Circle Inform-A-Gram No. B61.

Keller Power Hack Saws and Accessories, manufactured in eight models to meet all cutting requirements up to 6¾" x 6¾" are illustrated in a new catalog. Complete specifications for all models are included. Details from Sales Service Machine Tool Co., 2363 University Ave., St. Paul W. 4, Minnesota.

Circle Inform-A-Gram No. B62.

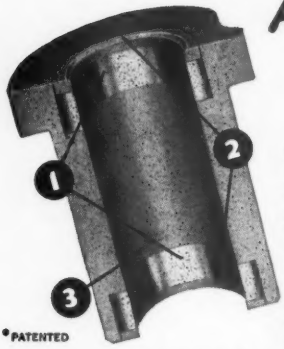
LOWEST COST PRECISION
FOR TOOL ROOM AND PRODUCTION
ONE PORTABLE MULTI-PURPOSE PRECISE GRINDER-MILLER WITH MACHINE TOOL MOUNT DOES THE WORK OF A SINGLE-PURPOSE MACHINE COSTING 100 TIMES AS MUCH!
Little can be done today to reduce labor and material costs. For substantial savings employ new, better techniques. Mount PRECISE Grinder-Millers on lathes, drill presses, milling machines and other machine tools or use in special production set-ups. ¼ HP; speeds from 20,000 to 45,000 r.p.m.; 115 volts, AC-DC. Ruggedly built for continuous duty. All metal housing; rigid PRECISE quill; sealed micro-precision bearings. High speeds and accurate PRECISE quill and chuck are ideal for tungsten carbide cutters. PRECISE will grind, mill or finish any material from soft wood to the hardest alloy steel.
Write FOR CATALOG
PRECISE PRODUCTS CO., 1341 Clark St., Racine, Wis.
PRECISE GRINDER-MILLERS

A New 24 Page Idea Book details the applications of "Hard-N-Tuff" processes that help you solve common hardening problems, effect economies, and improve your results in heat-treating. It is offered by Doughty Laboratories Inc., 500 Fifth Ave., New York 36, New York.
Circle Inform-A-Gram No. B63.

Extremely Good Resistance to Shock, high impact strength, and excellent wear resisting qualities are the outstanding properties of MGR, an air-hardening, non-deforming punch and die steel of the medium carbon, medium chromium family. New bulletin offers helpful hardening and tempering data, lists shapes in which MGR is furnished, and suggests applications for its use. LATROBE ELECTRIC STEEL CO., Latrobe, Pa.
Circle Inform-A-Gram No. B64.

The Modernair Corp., 400 Preda St., San Leandro, California, invite inquiries for their complete catalog of pneumatic and hydraulic control devices for industry. Modernair cylinders and control valves can be used wherever accuracy, strength, lightness and ease of machining are essential.
Circle Inform-A-Gram No. B65.

MORE HOLES—
MORE ACCURACY—
FASTER—
AT LESS COST



MEYCO
Carbide Inserted Bushings
Are Doing It Daily!

HOW? Like this: (1) Last longer . . . with a life—in most cases—as long as solid carbide bushings at prices that come close to the prices of ordinary steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man-hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!

*PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

For information and prices write for Meyco Bushing Catalog No. 17.

W. F. MEYERS CO., INC., BEDFORD, INDIANA

You Can Pierce ¾" Thick Mild Steel with the H.S. type Hole Punching Unit. These new hydraulic heavy duty units get their outstanding performance by using the compressibility of special fluids instead of the customary spring for the stripper. Write for bulletin H.S. to the Wales Strippit Corp., 345 Payne Ave., North Tonawanda, New York.
Circle Inform-A-Gram No. B66.

Automatic Dial Assembly Presses are featured in a brochure from the Precision Detroit Co., 2126 Fairview Ave., Detroit 14, Michigan. The presses are built in a range to six tons, and when combined with the PDC indexing table, have made possible production rates of 1500 pieces per hour in bearing ball and retainer assembly, 1200 pieces per hour in plastic knob and automatic disc assembly, and 3,000 pieces per hour in paper tube end assembly. Other uses of the press include staking, riveting, pressing, and forming, and marking.
Circle Inform-A-Gram No. B67.

Imported Vertical, Plain, and Universal Milling Machines are described in a catalog from Marac Machinery Corp., 1819 Broadway, New York, N. Y. These machines are made to extremely high standards, and have many outstanding constructional features. All spindles are of English dimensions, and all dials read in thousandths. Write for catalog on Werner No. 2 high precision Milling Machines.
Circle Inform-A-Gram No. B68.

Model 200 Erick Magna Holder for indicators has a precision adjustment making possible the most minute setting alterations without touching either holding rod or indicator. Cullen Mfg. Co., 1318 Clark St., Racine, Wisconsin, have issued a catalog sheet which details the model 200, and also their other indicator holder. Both models have a magnetic base-plate.
Circle Inform-A-Gram No. B69.

A New Tangent To Radius Wheel Dresser, Model KMF, is produced by the Byrd Tool & Mold Co., 2953 West 12th Street Extension, Erie, Pennsylvania. Need for height gages, micrometers and indicators is eliminated, and usual set-up time quartered. The accuracy and convenience of the device are obtained through the use of gage blocks and/or sine bar.
Circle Inform-A-Gram No. B70.

Special Automatic Machinery is pictured and described in a brochure from Krueger-Barnes Corp., Detroit 11, Michigan. High production rates are the feature of these machines. A special section is given to a continuous-cycle feeding and indexing mechanism, called "Feedex", which is manufactured in 16" and 24" sizes, and can be mounted on the tables of most standard drill-presses.
Circle Inform-A-Gram No. B71.

A New Slip-Free Pulley Surfacing compound can be quickly lagged in place by brush or spray. "Main Neoprene Pullag" gains strength over a period of time, reaching its maximum in 8 days; however, pulleys can be safely returned to service within 24 hrs. when necessary to do so. Pulleys can also be heat cured in 6 hrs. at 150° F. For descriptive literature, write to MAIN PRODUCTS CORP., 1241 Carpenter St., Rm. 227, Philadelphia 47, Pa.
Circle Inform-A-Gram No. B72.

The Story of Felt is a booklet presenting the history of this material of many uses, the essential steps in its manufacture, and listing scores of civilian and military uses for felt. Many of these are specialized industrial applications, including lubrication, vibration isolation, oil seals, gaskets, packings, polishing, and filtration. For your copy of "The Story of Felt", write AMERICAN FELT CO., Glenville, Conn.
Circle Inform-A-Gram No. B73.

A New "Tri-Matic" Over-load Release has been announced by the Dodge Mfg. Corp., Mishawaka, Indiana. Featured in bulletin A-616, the device is designed for use with the Dodge line of Torque-Arm Speed Reducers as an additional safety factor.
Circle Inform-A-Gram No. B74.

Electronic Strip-Chart Potentiometers and bridge instruments for industrial plant, research, and laboratory use are described in 36-page Bul. P1245. In addition to single and multiple point recording models, pneumatic and electric-operated automatic control models are illustrated. Profusely illustrated, bulletin shows component parts, new applications, and operational details. THE BRISTOL COMPANY, Waterbury 20, Conn.
Circle Inform-A-Gram No. B75.

A New Brochure Illustrates the Vibax Isometric-Dimetric Drafting Machine. With this equipment isometric and dimetric views can be quickly made by any draughtsman from standard orthographic drawings. Write Indamer Corp., 11 W. 42nd St., New York 18, New York.
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SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

. . . Body Stampings, from page 69

main fixed. Lower dies are elevated hydraulically and lift the work against the upper die. As soon as welds are made, the piece is lowered and is picked up by hinged dogs of the intermittent chain for advance to the next press. Before the dies are closed, of course, the parts to be welded to the pan are placed on it in correct position. In general, this placement is done by hand but, after a part called an outer rocker is welded to the pan in the first press, the pan conveyor crosses a secondary shuttle that carries the crossbars and also an "inner assembly". These are built up on a transverse conveyor, are picked up by the shuttle, Figure 5, and are transferred so as to rest on the pan in welding position in the second press welder. There the added parts are welded to the pan when the die is closed.

In the third press of the pan line, several other parts placed by hand are welded to the pan and in the fourth press many welds that could not well be made previously are made to complete the fastening of components (already partly welded) to the pan. In all, no less than 464 spot welds are made in the four pan welding presses. After the final welds are made, the pan is shifted to the end of the line where it is turned over automatically, as shown in Figure 6, and is deposited on the final inspection conveyor.

As the pan is advanced along this conveyor, inspectors mark any defects or missing welds and two men, using gun welders, make welds where missing or

Fig. 5. Crossbar shuttle at the point where it joins the main pan assembly line. There, the subassemblies carried are picked up and are transferred into the press welder in which they are fastened to the pan.

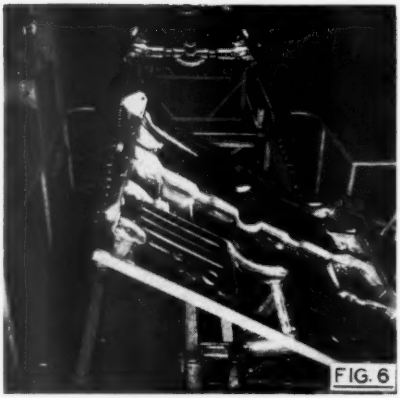

Fig. 6. At the end of the floor assembly line, the shuttle rocks the completed assembly onto this inspection chain line along which any defects found are remedied. Thereafter, subassemblies are loaded onto trucks for transfer to a shipping platform.

correct other faults. At the end of this conveyor, two men lift the assemblies off and stack them on a truck in which they are transferred to the shipping platform.

Work on the transverse line that feeds the main pan assembly line and was mentioned above involves a series of operations that start with minor subassemblies made in standard spot welders. These and other parts are then placed in fixtures on a chain and pass through a special semi-automatic press welder that finishes the subassembly spot welding. When these subassemblies are transferred to the main pan assembly line, the fixtures are returned to the starting end of the transverse line and repeat the circuit.

Paralleling the lines that stamp the pan and build it into a body subassembly are other lines that produce other panels and perform thereon such subassembly operations as can be done to advantage in a plant that serves a large number of body assembly plants. Naturally, each line has been designed and equipped with such presses, dies, welders, and handling equipment as are best suited to perform the respective operations needed. The net result is a highly efficient plant perfectly suited for the jobs it was designed to perform.

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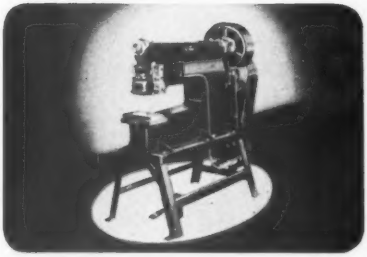

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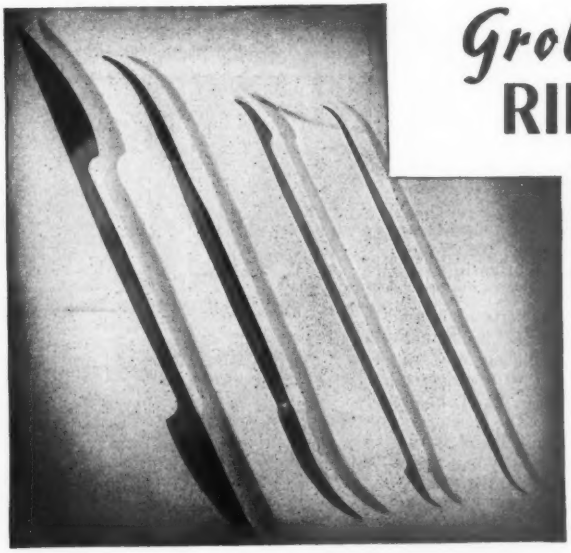

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. . . Band Machines, from page 74

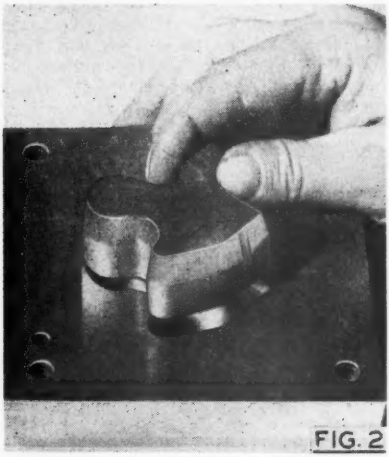

Fig. 2. Small production press punch and die machined from the same piece of steel as described in this article. Note that little remains of the saw starting hole after the die has been band filed to the outline and the punch likewise band filed to fit the die. In this case material savings are obviously negligible but every little bit helps plus the 50% reduction in sawing time.

ventional machining to finish both punch and die is immensely simplified. In recent years, more punches and dies formerly contour machined completely from separate pieces of steel are sawed out simultaneously from the same steel block to further conserve critical material although in some cases it means using somewhat thicker steel to attain the desired objective. Savings of as much as 40 pounds of critical material on a single job have been effected by this die making technique, plus, of course, the 50% reduction in sawing time.

The percentage of blanking die applications for the technique varies according to individual conditions, however, dies of any thickness from ½" to 6" can most economically be so machined if and when they can fill requirements, the material and manpower savings combined are obviously tremendous and especially so with substantially large and intricate die outlines. With the cutting of a die of plain design, that is if the opening is more or less square or rectangular, the material waste is negligible whether or not the punch and die are cut from the same piece of steel. On the other hand, material waste certainly increases rapidly under conventional procedure with any marked increase in the dimensions and complexity of the outline.

The single cut die making technique requires no expert operator but is subject to various dimensional requirements individually based on the thickness of the material. Angle of saw starting hole, diameter of drill, width of saw band, angle of cut, distance from die layout line to center of saw kerf are dimensional factors governed by thickness of die block. This technique involves three major steps:

First: The starting hole is drilled at an angle, it is started inside the die layout line, intersects the die layout line at the center of the block and emerges through the die block on the opposite side outside the die layout line. Second: The narrow precision saw band is inserted through the starting hole and butt welded. The angle of table tilt is slightly less than that of starting hole and at the correct speed the slug is completely sawed out at this angle. Thus, at the proper angle consistent with material thickness the slug has excess material. Third: Once the slug

(Continued on page 170)

Fig. 3. This is a substantially larger die block of 1¼" thickness and utilizing the "slug" for the punch will effect a saving of approximately 8 pounds of die steel costing at present 96c per pound.

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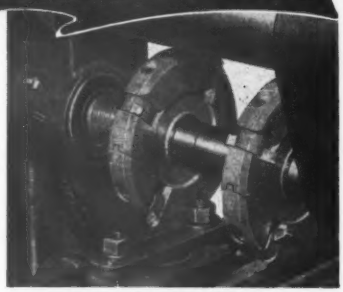
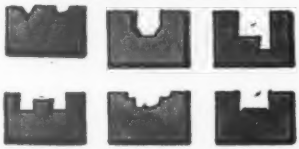


Above: STRADDLE MILLING



ABOVE—a few of the many cuts that can be made with the New-Field Universal Fly Cutter in ONE operation on a horizontal or vertical mill or drill press. Individually adjustable bit holders permit slots of any shape to be cut 3/16" to 2" wide.

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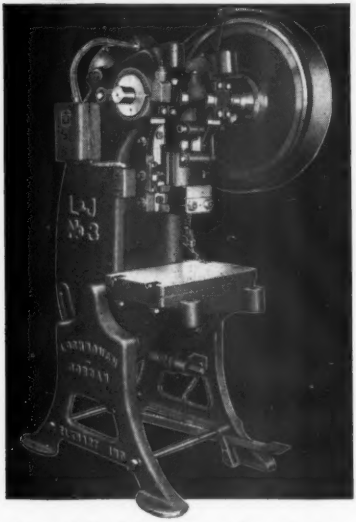

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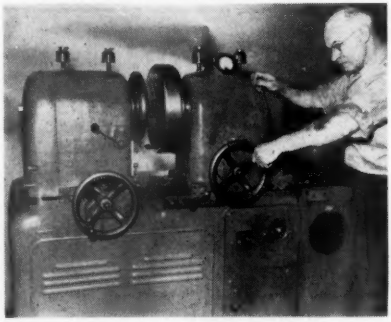
. . . Quiet Gears, from page 150



Above. Ring gear speeders are employed for 100 percent inspection of mating reduction gears to assure quietness of operating speeds.

Illinois gear checker of chart recording type, used for checking the first gear of each net setup on gear shavers and for each time a new Red Ring cutter is placed in operation. This assures accuracy of the setup since it is held to a limit of 0.0002 in. on the involute.

Besides the control of gear cutting, quietness of gear sets is subject to three independent 100 per cent inspection procedures. First mating gears are run in Red Ring gear speeders to check for noise before acceptance for assembly. After assembly, the reverse gear and reduction gear units are assembled and the resulting assembly is put through a standard test procedure to check on operating characteristics as well as quietness.

Finally, there is a third test in which the entire powerplant assembly—engine, reverse gear, and reduction gear—is run through a test schedule on the dynamometer. The final test usually takes about two hours and is designed to produce a finely tuned powerplant ready for installation in a hull and capable of operation by the owner without further tuning.

It may be noted that marine engines, unlike Chrysler passenger car engines, have a timing gear drive in which the camshaft gear is crown-shaved while the two mating timing gears are straight-shaved on Red Ring gear finishers. Here the Elliptoid-shaved camshaft gear provides the necessary alignment with the two mating gears and prevents edge loading due to misalignment.

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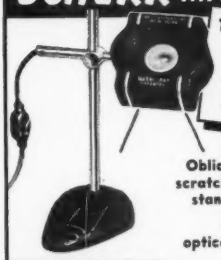

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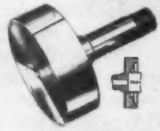

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SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

. . . Band Machines, from page 166

or punch has been sawed out and removed from the die, the die is band filed to outline or to fit template or master blank and then the punch is band filed to fit the die as required. If all dimensional requirements have been observed, all traces of the drill hole will have disappeared from the cutting sections of both parts.

Continental Process

Because of the fact that modern band machining techniques make it now possible to often give them preference over so-called short run press methods, the Continental process will for this reason only be briefly described but it should primarily be mentioned that the die making technique as already outlined naturally also applies to this type of die.

Contrary to conventional punch press practice, the die is not mounted and the punch is a floating punch. The unit, consisting of the following members, goes into the punch press as a universal fixture and may remain therein for all blanking, piercing, forming and drawing operations. A steel die shoe practically covers the entire area of the bolster plate or bed of the press, this shoe consisting of two halves must be made of boiler plate varying in thickness from 1½" to 2½" all depending on their area. A minimum "shut die space" of ½", with screw adjustment way

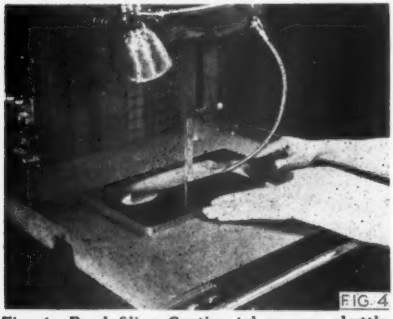

Fig. 4. Band filing Continental process shuttle-actuated die made of ⅝" low carbon steel. It is a die design such as this one that truly reflects savings in labor and material when both parts are contour sawed from the same piece of steel. For example, if this were a production press die of 2" steel, the punch would require another 28-pound block; however, the "slug" removed from the die would still retain some of its value.

Fig. 5. One of the typical set-ups by means of which metal stampings are economically produced by contour sawing. Large parts are preferably handled as shown, smaller parts are prepared for sawing by pressing them together and either soldering or bead welding the stack at various locations. Stampings are often so produced in stacks utilizing full sawing capacity height of band machine.

down, is obtained by using a bolster plate of proper thickness. The lower plate is provided with a row of ½ tapped holes to accommodate the side brackets and catch pan. There is also a "turn table" stock bench mounted on a pedestal which is adjustable for height, the pedestal is also constructed so the stock bench can turn on a bearing or axis on top of the pedestal. This assembly is placed on the right hand side of the punch press.

The number of stampings produced per hour is expectedly less with this method than with a high production die because the operator must move the die forward and reset it for each impression. With plain blanking dies, compound and progressive blanking dies, of this type, the average output will vary between 70 and 700 per hour. Tests have shown that for plain blanking, the hourly output is about one-third that of the conventional die. In other words, as a basis for comparison, this type of die would produce 333 stampings per hour while a conventional die would produce 1000 per hour.

(Continued on page 178)

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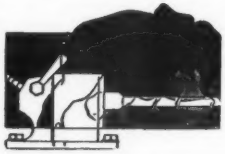

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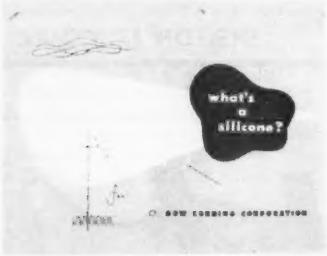
Applications of Silicones to Industry are discussed and illustrated in a stimulating booklet from the Dow Corning Corporation, Midland, Michigan. Silicones are manufactured in the form of fluids and oils, greases and compounds resins, varnishes and rubbers. They remain positively stable in extremes of heat and cold, and their efficiency is not reduced by moisture. Durability is at least ten times greater than that of comparable organic compounds. Silicone grease applied to a core oven conveyor system working at 700° F eliminated bearing failure. There are over a hundred silicone



products, the booklet suggests far more than a hundred applications.
Circle Inform-A-Gram No. C1.

A New Preventive Maintenance Booklet is now available from the Westinghouse Electric Corporation. The booklet discusses general preventive maintenance programs, designed to reduce shut-down time on production lines, and treats in considerable detail the most important ingredients of production line apparatus—power equipment. A suggested schedule of work and cleaning on power equipment is presented in chart form, and the reader is referred from the chart to the general body of the booklet for more specific information. This general body contains all the information on the preventive maintenance for turbines, generators, switchboards, motors, controls, and many other types of electrical apparatus. Westinghouse Electric Corporation, Box 2099, Pittsburgh 30, Pa.
Circle Inform-A-Gram No. C2.

Maintenance of Chain Drives and Conveyors is described in a bulletin from the Chain Belt Co. of Milwaukee. Of great interest to all who design, install, and maintain chain drives and conveyors, this booklet shows how to get the most service from your sprocket chains. Illustrations show graphically the correct and incorrect ways of solving chain installation, operation, and maintenance problems. For your copy, request Bulletin No. 51-7 from the Chain Belt Company, 1600 West Bruce Street, Department PR, Milwaukee 4, Wis.
Circle Inform-A-Gram No. C3.

The Weldability Characteristics of aluminum bronze sheet and plate are discussed and profusely illustrated in a reprint of a talk presented to the annual meeting of the American Welding Society. Charts and graphs help describe welding techniques and processes such as carbon-arc, metal-arc, inert gas consumable electrode and submerged arc. Fabrications of aluminum bronzes are also described. Ampco Metal Inc., Milwaukee 46, Wisconsin.
Circle Inform-A-Gram No. C4.

A New Grinding Manual, called the ABC of Surface Grinding, is available from Norton. It contains 88 pages, and is attractively set out and illustrated. It is divided into three broad sections; grinding know-how, wheel selection, and trouble-shooting. The first of these sections includes general hints, vertical and horizontal spindle surface grinders, rotary table machines and the magnetic chuck. The second has tables of wheel recommendations, and the third surface grinding flat-rolled sheet steel, and Norton Chucks and segments. Norton Co., Worcester 6, Mass.
Circle No. C5.

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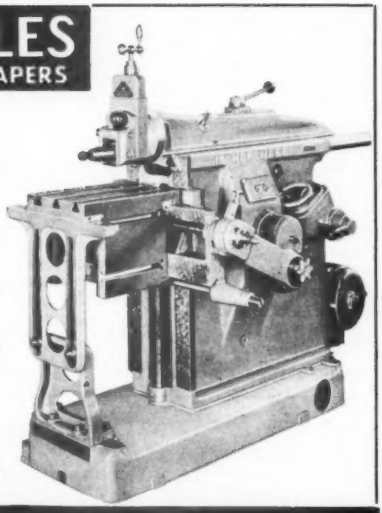

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OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

The "Super Scottsonizing" Process is explained in a new booklet from C. U. Scott & Son, Rock Island, Illinois. The booklet is presented to those who are interested in the hardening of stainless steel parts that are finished to size. After processing, parts cannot be ground, drilled, lapped, or annealed, and remain hard at 1000° F. Tolerances can be held to ¼ of 1/10,000 during the process, and results indicate a wearing surface far superior to any yet obtained with the carbon or the alloy steels.
Circle Inform-A-Gram No. C6.

Drop Forging Topics, Volume 16, No. 2, is now available from the Drop Forging Assoc., 605 Hanna Bldg., Cleveland 15. This issue contains articles on a new drop-forged gear tooth design, airframe design experiments which may open new applications for closed-die forgings, and drop-forged worm gears. In addition to these and other features, the issue also gives information on various reference books and papers, including "Standard Practices and Tolerances for Impression Die Forgings", and "Metal Quality", a reference book on forgings.
Circle Inform-A-Gram No. C7.

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Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

A New Decimal Equivalent Wall Chart has been announced by John Hassall Inc., Clay and Oakland Streets, Brooklyn 22, New York. The new chart is accurate to four decimal places, and is printed in three colors to signal decimal-equivalents or fractions. The chart is framed by types of cold-headed products manufactured by John Hassall.
Circle Inform-A-Gram No. C8.

Welding Tools and Dies Is Described in a new bulletin from the Alloy Rods Company, York, Pennsylvania. The bulletin features the use of "Tool-Arc" tool steel electrodes, and is a technical "how to do it" piece which gives valuable welding information. There is a Tool-Arc electrode to match each of the five basic types of tool and die steels, for oil, water, and air hardening, and for high speed and hot work. Electrodes are also available for the welding of forging, drawing and forming dies. The bulletin gives complete information on sequence and procedure for the process, including data on heat-treating. Alloy Rods Bulletin AR 52-1.
Circle Inform-A-Gram No. C9.

A New Die Block Handbook is available from Heppenstall Co., 4620 Hatfield St., Pittsburgh. Heppenstall die steels and other products are described. It also contains many helpful tables, such as comparative hardness, draft angles for die blocks, a shrink chart, decimal fractional equivalents, a temperature conversion chart, and die block weights.
Circle Inform-A-Gram No. C10.

"How to Run a Metal Working Shaper" is the title of a new 32 page illustrated handbook from the South Bend Lathe Works, South Bend 22, Indiana. Copies sell for 25¢, and are designed as a manual for the South Bend 7" shaper. Set-up and operation are covered, and over 65 illustrations show shaper parts and the grinding of shaper tools bits.
Circle Inform-A-Gram No. C11.

A JICircuit Guide has been developed by the Denison Engineering Co., Columbus 16, Ohio. Printed in booklet form, the guide contains a complete list of the Hydraulic Standards for Industrial Equipment approved by the Joint Industry Conference, and a ready key to all Denison hydraulic equipment. A drawing template which accompanies the booklet is divided into sections including directional control spool types, outline symbols for three and four-way directional control bodies, pressure controls, and pumps fluid motors, cylinder and ram, surge damping valves, and check valves.
Circle Inform-A-Gram No. C12.

Friction Sawing of Cold Steel is being used in an increasing number of applications. A paper on this subject presented before the IASE annual meeting is available from Kling Bros. Eng. Works, N. Kostner Ave., Chicago 51, Ill. The paper describes the principles of the process as well as some of its applications, and has information on saw blades, and other equipment. A typical performance obtained by this method is the cutting of a 10¾" O.D. pipe in ten seconds. Another mass production application which is instanced in the paper is that of a 36" saw used to cut the ends on rear axle housings.
Circle Inform-A-Gram No. C13.

Fabrication of Type 430 Stainless Steel is the Subject of a bulletin prepared by the Armco Steel Corporation, Middletown, Ohio. Forming, spinning, and drawing operations are first dealt with in detail, with practical hints and illustrations. The bulletin then features an extremely valuable section on welding practice for type 430, and tables of the mechanical properties of fusion-welded joints and spot welds.
Circle Inform-A-Gram No. C14.

The Recommended Use of "Tempilsticks" in industry and research is described in an instruction sheet from the Tempil Corp., 11 W. 25th St., New York 11, N. Y. Tempilsticks are crayons with calibrated melting points, and the sheet covers their application in determining attained temperatures of rapidly moving pieces and rotating objects, temperature distribution and isothermal boundaries of a heated workpiece, and methods of temperature indication against a brightly radiating background.
Circle Inform-A-Gram No. C15.

Welding of Mild and Low Alloy Steels, together with complete information about the available electrodes, is discussed in a booklet from McKay Co., Pittsburgh 22, Pa. Essential data on all McKay mild steel, low alloy, and special purpose electrodes is presented in handy form of "Quick Selection" charts. A second section of the manual is devoted to McKay electrodes designed for hard surfacing and welding for repair in such applications as railroad switch points, tools and dies, punches and cutting tools.
Circle Inform-A-Gram No. C16.

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. . . Whirlpool Tooling, from page 67

Fig. 9. After drawing the pocket in the piece shown at left, the piece is located from the pocket in another die and is formed to the shape shown at the right. Trimming and edge turning are done in a third die.

forms the bottom and the top edges of the stamping, after which a cam operated expanding die trims and turns the edges of the sides inwardly and then contracts to clear these flanges and permit removal of the work piece from the die.

Another stamping for use in ironers is a belt guard shown in Figure 10, after the second operation (left) and the final operation (right). The finished piece is really a quarter section of a drum having one integral head and is produced initially by drawing a drum or deep cup in the conventional way. Then the cup is placed closed end up in a second die that pierces two diametral slots 90 deg. apart, forming a cross. Finally, the slotted drum is placed horizontally over a horn die and four longitudinal cuts are made along the cylindrical walls to convert the drum into four belt guards of the desired shape.

Hinges for dryer doors have an unusual double hook shape and are produced in a five-stage progressive die in the setup, Figure 11. The press is a 75-ton Clearing

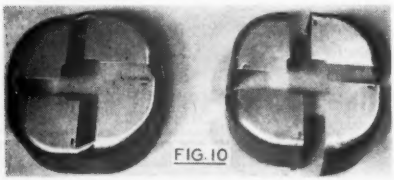

Fig. 10. The drawn and pierced stamping at left is made to be cut apart, as shown at right, on a horn die, to form four identical belt guards.

having a 5" stroke and driven at 90 working strokes a minute. Coil stock used is 13-gage and 5" wide and is advanced by a standard U. S. feed. Figure 12 shows a strip from the die and the finished piece which is cut off and formed at the fifth station after which it is air ejected.

As the strip indicates, the first three stations pierce out successive portions. At the fourth station, the rear end of the piece is trimmed and four welding projections are formed. This leaves two points of attachment to side strips and these are severed at the fifth station, leaving the two- C-shape portions free to be formed upward to their final parallel position in planes at right angles to the plate having the projections.

At 90 strokes a minute, the die has a capacity of 5400 pieces an hour and will

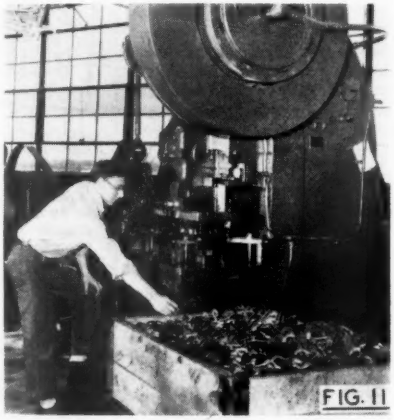

Fig. 11. Setup of a five-stage progressive die in a 90-ton press to produce the specially shaped hinge stamping shown in Fig. 12.

produce this number unless stops for adjustment are required. Before the strip enters the die, it passes between rolls that apply lubricant and this helps to keep die parts in good condition.

Another part produced in a six-stage progressive die setup in a 75-ton Clearing press is the caster plate for conventional wringer type washing machines. A strip from this die appears in Figure 13 and

(Continued on page 180)

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. . . Band Machines, from page 170

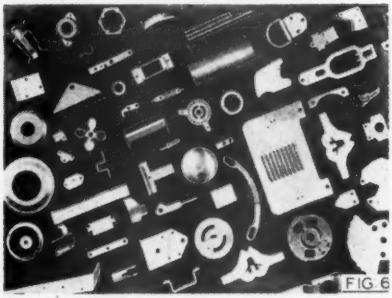

Fig. 6. Typical assortment of stampings produced by a manufacturer specializing in this type of work. Requisitions vary from 50 to 50,000 units and naturally all three methods of production have their respective time and place for maximum operating efficiency.

Continental Die Process Versus Contour Stack Sawing

Having reached dependable conclusions as to when the use of the thin die is definitely more economical than conventional procedure, we must now decide what effects the stack cutting technique has over the thin die process. We have here two distinct short run production methods, but the same previous problem of choosing the proper course based on the quantity of stampings involved. Regardless of the fact that labor cost per piece is high with contour sawing procedure, Continental die cost when spread over a small amount of stampings is often out of proportion when computing actual production costs. The production of sheet metal parts by contour sawing is, especially, "punch and die abbreviated" and the process is most simple.

The length and cut and total material thickness, rather than intricacy of outline, are controlling production cost factors. As for example: If the stack is 5" high and the outline is of average design, the cutting rate should average ¼ lineal inch per minute. Now assuming the material is 1/16" stock and the total cut represents 25 inches, production time would be 1 hour and 40 minutes. Based on a sawing operating cost of $2.50 per hour, production cost per unit would be approximately five cents. Were the same quantity of stampings produced by the Continental process, tool cost per unit alone would reach thirty cents or it would require 500 stampings to equal contour sawing cost per piece.

The chart (Figure 7) shows the convergence of cost per piece of the same part as produced by the three methods. Results indicated in the graph are based on a combined labor and overhead cost of $4.00 per hour, with costs of production and Continental dies respectively estimated at $200 and $35. After repeated tests, involving various quantities of stampings, it was concluded as graphically presented that contour sawing was more economical than the Continental die for runs of less than 500 pieces and likewise more economical than production press work for runs as high as 2000 parts.

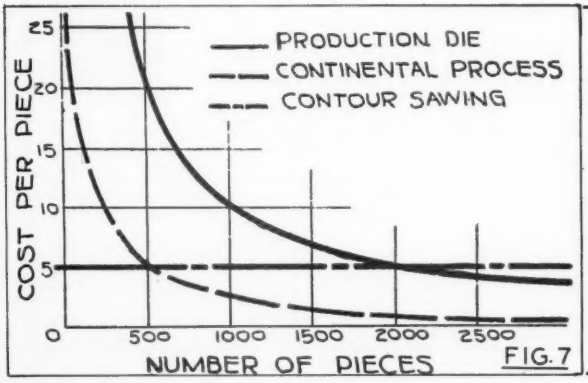

Fig. 7. Graph showing the convergence of costs per unit by the three methods outlined. After repeated tests, involving various quantities of stampings, it was concluded as graphically presented that contour sawing was more economical than the Continental die for runs of less than 500 pieces and likewise more economical than production press work for runs as high as 2000 parts.

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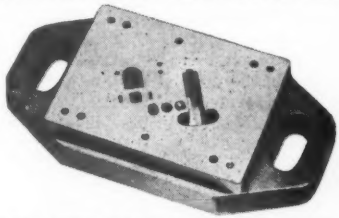
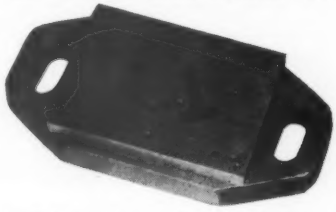


DIE AFTER ORDINARY HEAT TREATING — NOTE: SCALE, PITTING



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. . . Whirlpool Tooling, from page 176

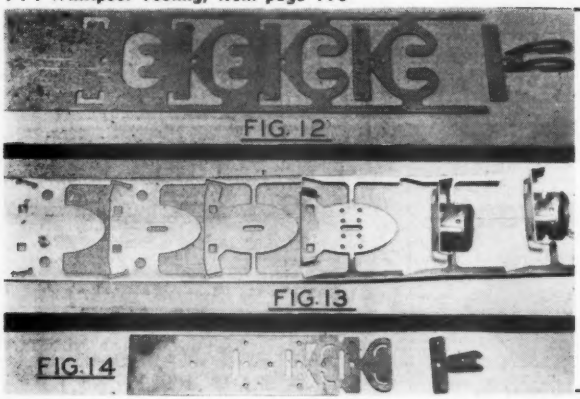

Fig. 12. Strip from the progressive hinge die, Fig. 11, and the finished hinge that is cut from the strip at the final station. Diple-like projections embossed in the stamping are for welding it to a mating part.

Fig. 13. Strip from a six-stage progressive die that forms the caster plate for the leg of a washing machine.

Fig. 14. This strip is from a progressive die that forms a different size and shape of hinge than that shown in Fig. 12. Projections for welding are embossed in the fourth position.

shows the successive piercing and forming operations as well as that in which projections are embossed. At the fifth station in this die, the portion containing the projections is formed with flanges turned upward at each side, but the piece remains attached to the strip. It is cut off at the final station.

Material for this stamping is 16-gage 4¼ in. wide. The press operates at 90 working strokes a minute.

Still another progressive die makes a smaller hinge than that shown in Figure 12. This hinge and a strip showing the successive piercing operations appear in Figure 14.

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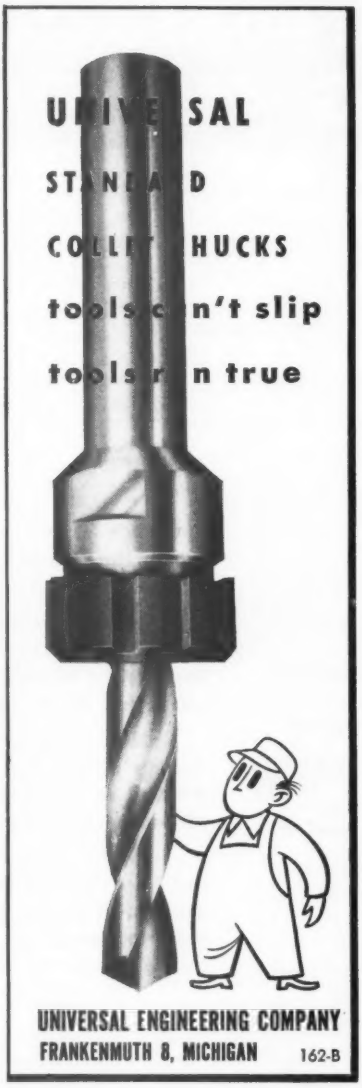

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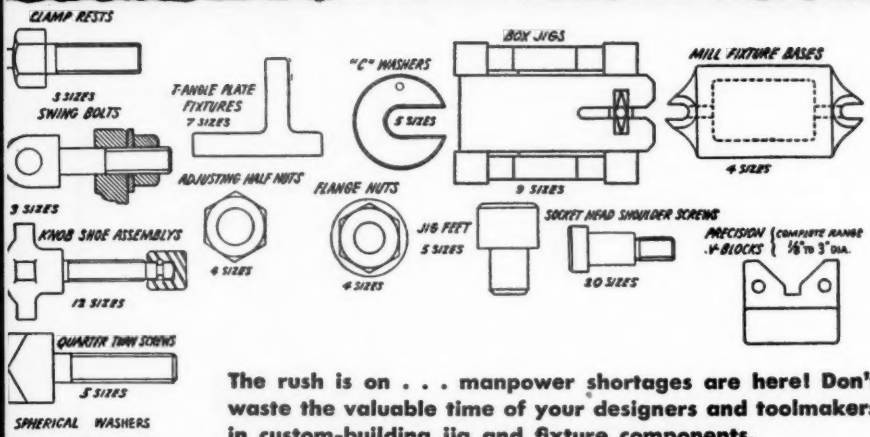

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the stroke. All buttons then had to be released and all buttons again pressed to continue the stroke. After passing the bottom, the ram would automatically return upward to the top and stop. Again all buttons had to be released, then pressed to make another stroke.

Another convenient feature was a remote control for the ram adjustment motor. This was attached to a rubber-covered wire long enough to allow the setup man to place it close at hand while setting any die.

The eleven cabinet parts for which this installation was tooled were the three components of the inner food compartment, the outer shell and back, the inner and outer covers for the evaporator openings, and four reinforcement parts for the outer shell.

The production of these various parts was necessarily in lots which were stored after the press brake operations were completed. Tangent forming of the outer shell and U-forming and welding of the liner were completed immediately prior to the cleaning and enameling processes.

The miniature assembly-line technique used in this plant was planned for approximately 25 refrigerators per day. Thus for a 22 day month, the total requirement was 550 pieces of each kind, made on eleven die setups.

Using a fork-lift truck for handling dies, the total estimated time for all die setups required approximately 40 hours. This became an important factor in production planning. By running the required number of parts for one month's production, approximately 25% of the total time had to be allowed for die setups.

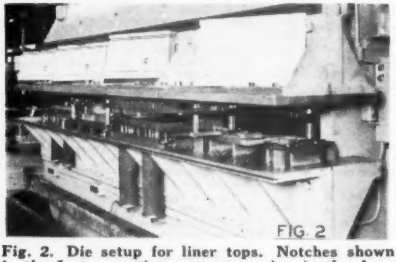

Fig. 2. Die setup for liner tops. Notches shown in the first operation prevent tearing in the draw die. Draw-ring pressure is provided by four rubber cylinders, two of which are on the rear. Two smaller cylinders at the far left provide pressure for the final flanging operation.

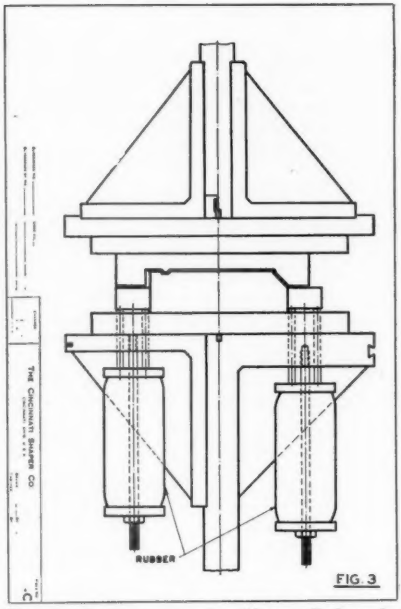

Fig. 3. Arrangement of rubber cylinders for draw-ring pressure. Also shows liner top with one side pulled out of draw ring.

The estimated production time for running one month's requirements of parts totaled 45 hours. Thus, with one die setup of each kind per month, a total of only 85 hours per month was anticipated, allowing a generous margin of time for increased production or addition of dies for producing other parts of the cabinet.

Many factors influence the design of dies for the press brake. Here we will discuss only the factor of operation balance. The most desirable condition is that each individual die in a series used on one component complete its function in the same number of press strokes. That is, if each die requires only one stroke, all are in balance with a completed piece coming off at each press stroke. Likewise, if two

(Continued on page 190)

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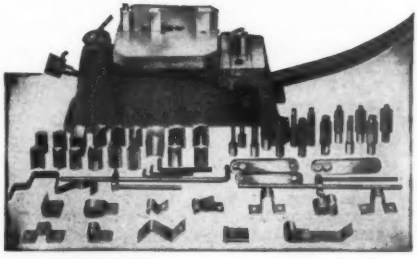

Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to punch, bend and cut round or flat brass, bronze, aluminum, steel, etc., up to 3/16" x 1½" as illustrated, other models up to ¼" x 4".

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SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

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QUICK-PIC

GRINDING
Norton's condensed catalog shows full line of grinding and lapping machines, including cylindrical, tool room, universal and surface grinders.
Circle No. E5.

CARBIDE MILLING
Bulletin illustrates unique wedge-lock for inserted blades in McCrosky universal milling cutters. Blades only are changed for right or left hand rotation, positive or negative angles.
Circle No. E6.

HYDRAULIC
Logansport manual covers basic design of fluid power circuits for increasing machine and man productivity. Includes typical circuits and symbol index.
Circle No. E1.

CONTOUR FORMER
New 32-page booklet describes the Bath Contour Former. It shows how flanges are formed wrinkle free, and extrusions without loss of cross section.
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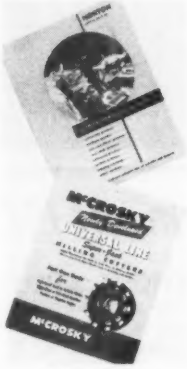

SWITCHES
Bulletin describes a line of high capacity enclosed switches for severe industrial service in automatic control circuits. Included are sealed precision limit switches.
Circle No. E9.

COMPARATOR
Circular describes Portman's Century optical comparator, offering sharp image definition, glare free accuracy, and swing away stage.
Circle No. E10.

FOOT SWITCHES
Bulletin illustrates the Linemaster foot treadle switch for actuating relays, solenoids, and magnetic switches, leaving hands free for other work.
Circle No. E3.

SQUARE HOLES
The Swisma milling machine will produce multi-sided holes with flat, concave or convex surfaces, and corner radius 1/10 distance across flats. Requires no templates.
Circle No. E4.

COLLETMANDREL
Expanding mandrel that grips and releases work on the I.D. operates like a collet in reverse. Westberg bulletin cites fast gripping, long lasting, and fast releasing features.
Circle No. E11.

RIVETERS
Lemert bulletin tells how rotating impact riveters permit riveting on fragile, unsupported and soft parts as well as heavy work.
Circle No. E12.

FORM TRUEING
Circular describes new larger Diaform attachments for form trueing of complicated contours on grinding wheels up to 20" dia. Forms 3" wide and 1" deep cut in a few hours.
Circle No. E7.

STEEL FORGINGS
Brochure describes Allegheny Ludlum's production, service, and sales facilities on the Pacific Coast for industrial buyers of steel forgings.
Circle No. E8.

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CATALOGS

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COUNTERS

Catalog lists many types of PIC counting instruments including mechanical stroke revolution counters, electric counters for control panels, photo-electric counters, etc.
Circle No. E17.

DIE CASTING

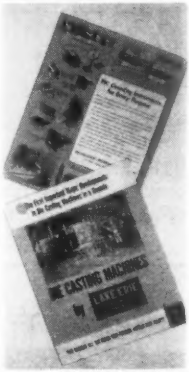
Line of improved die casting machines is illustrated in bulletin. Features include self-compensation for expansion, automatic pressure booster for uniform density.
Circle No. E18.

FLEXIBLE PIN

The Spiral machine pin, in the form of a coiled flat spring, permanently locks in place in any hole; eliminates the need for reaming, tapered holes, shrinking, or press equipment.
Circle No. E13.

PRESSES

Bliss condensed press catalog illustrates the company's complete range of mechanical and hydraulic presses for many metal forming operations.
Circle No. E14.



MILLING MACHINE

Swiss Mikron lathes and millers form subject of circular. A toolroom model does horizontal and vertical milling, also angular milling.
Circle No. E21.

STORAGE RACKS

Barrett-Cravens steel storage racks are shown in bulletin being used for drums, barrels, crates, bins, skids and pallets to save floor space and reduce handling costs. Bulletin available.
Circle No. E22.

TURRET LATHE

Rapid production of precision parts from bar stock or chucked blanks is obtained with Simmons No. 2 ram type turret lathe. Bulletin available.
Circle No. E15.

ALL-ANGLE MILLING

Fray Type 4 heavy duty milling attachment, for use on various machine tools, permits working at any angle without changing the work setup.
Circle No. E16.

PRECISION MILLING

Werner No. 3 universal, vertical, and plain millers are presented in descriptive bulletin. Millers feature automatic feed in six directions.
Circle No. E23.

GLASS BEARINGS

Caldwell bulletin shows line of glass protected sleeve and pillow block bearings, pump spiders, and other components for severe acid, alkaline and wear conditions.
Circle No. E24.

LUBRICATION

Manzel automatic spray system forces timed jets of oil mist direct onto punches and dies. Operates from either reciprocating or rotary motion.
Circle No. E19.

SOLENOID VALVES

Skinner stainless steel electric valves for automatic control are listed in bulletin, which shows construction of models available. For pressures up to 3000psi; orifices to 6".
Circle No. E20.

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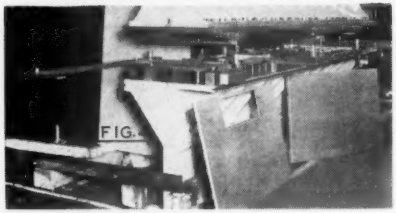

Fig. 4. Sides-and-back of liner ready for U form. Changes in arrangement of holes in the large perforating and trimming die can be made without removing the die from the press brake.

strokes are required at each die, material again flows smoothly with a completed piece for every two strokes.

In only one of the following cases was out-of-balance production encountered. In that case, the first operation and third operation dies each required two strokes while the second operation die required only one stroke. This condition was changed by dividing the second operation die into two dies requiring one stroke each. The second operator then served both second operation and third operation dies, achieving balance with the two-stroke cycle required by the first operation and fourth operation dies.

Two of the most difficult parts to be made were the tops and bottoms of the food compartment. The tops are illustrated in Figure 2. Since these are almost identical with the bottoms, a single discussion serves for both.

The design used in the U.S.A. was changed to permit hand gas welding assembly of the liner components instead of seam welding. This changed the design of the tops and bottoms so that a deeper, more difficult draw was required. Holding pressure for this, as well as for other drawn parts, was supplied by rubber cylinders under the over-hanging portions of the press brake bed as illustrated in Figure 3. These were easily adjustable to give the desired draw-ring pressure.

A notching operation was found to avoid tearing the stampings at two of the difficult sections. The notching was done as a first operation as shown in Figure 2, the part then being passed to the next station to the left where the draw position operation was performed. This was an especially interesting draw die since one of the four sides was allowed to pull completely out from the draw ring at the end of the stroke while the other three sides remained under the ring as shown in Figure 3.

The third operation die trimmed and perforated the drawn stamping, leaving a 45 degree edge on three sides that was desirable for the fit up and welding operations as illustrated in Figure 6.

The fourth operation formed up the front flange, again using rubber cylinders for pressure, in this case, to avoid a more expensive die design using springs.

The third component of the liner comprised the sides and back, a single piece, as shown in Figure 4. The operations were so arranged that the first and fourth operations required two strokes, while the second and third required only one stroke each. To balance the operations, a single operator served both second and third stations, transferring the piece between press strokes, as described in a preceding paragraph.

The first operation consisted of a partial form die for the front edge, to shape the metal properly for the second operation.

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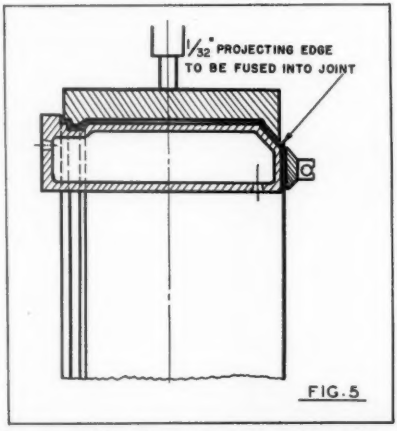

Fig. 5. Welding fixture for liners. Shows fit up of trimmed edge on liner top and excess metal to be fused into joint by gas torch.

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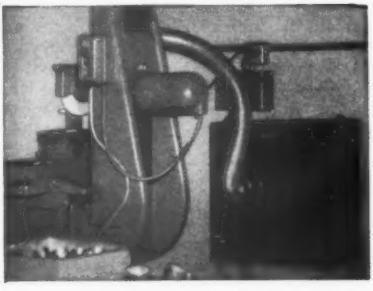

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

Safe Equipment in Press Shops and Keeping it Safe

When I started to consider this question of safe equipment, I made a list of the things that I felt would contribute to safe equipment. This would include:

Enclosed Gearing

It is always good practice to enclose gearing, but in a punch press it is even more essential because the large forces involved may cause overloading, which in turn could cause fatigue cracks to start in the shaft or gear. On one occasion we had an intermediate gear split in half, because of inadequate guarding and it fell to the floor. Fortunately no one was injured. However, it shows the need for rugged gear guards. These guards should be made of plate rather than sheet metal and well fastened.

Enclosed Wiring

It would seem that no one should have to be reminded that wiring should be enclosed and yet it is surprising the number of machines that one sees with inadequate wiring, frayed insulation, etc. All wiring should be enclosed in metal conduit to protect operators and maintenance men.

Disc Type Friction Clutch or Equivalent

When I wrote this item down, what I had in mind was that the clutch should be able to be disengaged at any portion of the press stroke and stop the press. There are other ways to do that same thing but the principle of being able to disengage the clutch at any point in the press stroke, is important. It enables the operator to quickly stop the press in case something goes wrong. For example, if a piece of material is improperly loaded or something falls between the dies the operator may without thinking reach between the dies. With the proper control and this type of clutch the press would stop because the operator released the push button. It therefore serves two purposes, protecting the operator and the die.

by **George I. F. Theriault**
Supt. of Maintenance,
Plant No. 2, Frigidaire Div.
GENERAL MOTORS CORPORATION,
Dayton, Ohio

Provision for Reversing the Press

When something is jammed between the dies, it is often necessary to reverse the press by hand and reconnect the motor in the reverse direction. The safest method would be to arrange the press control so that the press can be run in the reverse direction or back up at the discretion of the job setter and then only under the control of the inch button, so that it could not be run normally in this manner.

Centralized Lubrication

This may seem to be an odd point to make in considering safe presses and yet the size of present-day presses means that unless centralized lubrication was used, the oiler would be subject to greater hazards in climbing ladders, etc., to lubricate the various points. We try, whenever possible, to change all presses so that the majority of the lubrication is down to floor level.

Ladder to Top of Press

In lubricating the flywheel bearings, motor, and certain other parts on top of the press as well as repairing and adjusting these parts it is frequently necessary to get to the top of the press. It is good safe practice to provide permanent ladders with a good enclosure of some kind, for the use of oilers and repairmen.

Guard Rail Around Press

As stated in the previous point, it is frequently necessary to work on top of the larger presses. In order to prevent falls it is highly desirable to build a catwalk and guard rail on top of the press so that any necessary adjustments can be made safely and quickly.

Adequate Ram Screw Adjustment Locks

In a large number of cases, press shut-heights are frequently adjusted to fit dif-

(Continued on page 196)

Mr. Theriault's article originated as an address before the National Safety Council's 1951 Congress. We gratefully acknowledged the Council's permission to present it here. Ed.

. . . Cold Forming, from page 132

Trimming is usually a secondary operation on an item which has been previously formed such as in the case of a forging or a draw item. In the trimming of a flange, the die is very similar to that used in blanking with the exception that it contains a locating pin for the positioning of the formed part. In the trimming of a straight sided drawn container, the shell is placed in a flat die which fits at the trimming level, then another die is brought down inside the shell at the same trimming level. The sidewise motion of the second die in several directions from the neutral axis will trim the shell. The lathe can also be employed in the trimming of straight sided shells by the use of a parting tool, however subsequent operatoins may follow which would include threading, beading, curling, etc.

References

1. 'Forming of the Austenitic Chromium-Nickel Stainless Steels', V. N. Krivobok and G. Sachs, 1947 ed., The International Nickel Co., Inc., New York.
2. 'Drawing Stainless Steel Milker Pails', W. Ellingboe, The Iron Age, Nov. 11, 1948.
3. 'Drawing Characteristics of Stainless Steels', R. H. Henke, Steel, Sept. 4, 1950.
4. 'Cold Forming Stainless Steels', L. F. Spencer, The Iron Age, March 31 and April 7, 1949.
5. 'The Cold Working of the Stainless Steels', L. F. Spencer, Steel Processing, Aug., Sept., Oct. and Nov. 1950.
6. 'Verson Die Manual', Verson AllSteel Press Co., Chicago, Ill., Bull. DM48.
7. 'Forming Metal Shapes by Cold Rolling', E. J. Vanderploeg, Machinery, Feb., March, May, June and July, 1948.
8. 'Cold Rolled Formed Sections', E. J. Vanderploeg, Product Engineering, Sept. 1949.
9. 'How to Select a Press', Bull. G-47, Verson AllSteel Press Co., Chicago, Ill.
10. 'Plastic Working in Presses', E. V. Crane, 1945 ed., John Wiley & Sons, New York.
11. 'Fabrication of U.S.S. Stainless and Heat Resisting Steels', U. S. Steel Corp., N. Y.
12. 'The Metallurgy of Deep Drawing and Pressing', J. D. Jevons, 1942 ed., John Wiley & Sons, N. Y.
13. 'Resistance to Sensitization of Austenitic Chromium-Nickel Steels of 0.03% Max. Carbon Content', W. O. Binder, C. M. Brown and R. Franks, Transactions Amer. Soc. for Metals, Vol. 41, 1949.
14. 'Bliss Power Press Handbook', E. W. Bliss Co., Toledo, Ohio, 1950 ed.

(To be continued)

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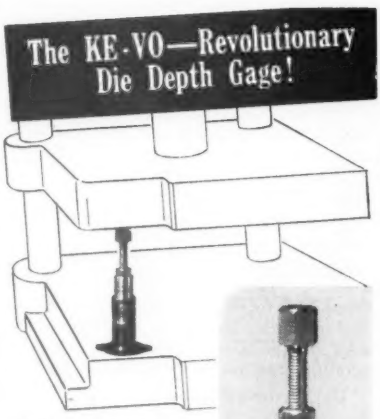

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. . . Tooling Press Brake, from page 190

The second operation as finally executed trimmed the two edges previously formed and perforated all holes for shelf supports, evaporator supports, cabinet assembly holes, etc., omitting only the large opening for the evaporator. This die was designed with easily removable punches or groups of punches, arranged to produce three different models.

Because of the difference in opening for the two types of evaporators, two third-operation dies were required for the three models. These dies were combination blank and form dies, forming the edges of the opening slightly for additional stiffness at the same time that the opening was blanked out.

The fourth operation completed the flange on the two front edges. Due to the storage problem, the final operation of bending these parts into the U form was done on a special bending fixture just before the welding-assembly.

Although it has no bearing on the press brake tooling, an interesting side light is furnished by the welding-assembly of the three liner components. Using a combination of air and hand clamping, the parts were positioned in a water cooled fixture as shown in Figure 5. The small projecting portion of the side was used as material to be melted into the joint. By skillful control of torch temperature, the excess metal was fused into a solid joint. A welding rod was kept handy, but seldom needed by the welder. Notice that the 45 degree sheared edges of the top stamping fit up without an inside burr, and may

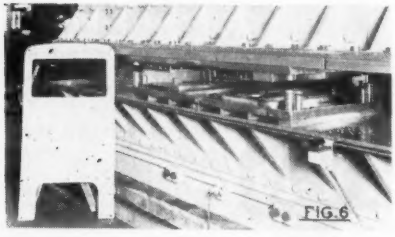

Fig. 6. Back panel made complete from rectangular sheared blank in one operation. Die is arranged with positive stops to prevent damage to die parts by ram position being adjusted too low.

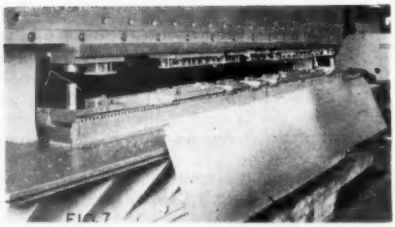

Fig. 7. Bolsters contain movable units for notching and punching the outer shell blank. The top edge is gauged at the front of the die; the bottom edge at the rear. Notching scraps fall through the lower bolster and out the rear side.

even fuse completely during the welding process.

The backs of the cabinets illustrated in Figure 6 were made in a single die from a rectangular sheared blank. The curved top edge was trimmed to shape and all holes pierced. The evaporator and compressor openings were blanked and flanged by a combination shear and form operation within the die.

The inner covers for the evaporator opening were made in four dies. The first die made two notches whose purpose was to gauge the stock in proper location for the second operation of drawing a bump for the light socket. This draw die was made with springs for draw-ring pressure. The third die punched the assembly holes and drew a $\frac{1}{16}$" flange for a stiffner with a pinch-trim at the bottom of the stroke. The fourth die punched holes for the light socket in the previously drawn bump. Using four operators, production was one completed piece per stroke.

The outer covers were also made in four dies. The first operation was blanking from a square sheared blank. The second operation was a shallow draw, leaving a narrow flange turned outward. Because of the small draw-ring travel, springs were used for pressure in this die. The third operation punched holes for assembly and the fourth reverse-flanged one corner. Again, production was one completed piece per stroke.

The front cross-rail for the lower edge of the food compartment opening was completed in two dies, the first piercing all holes and embossing all welding pro-

(Continued on page 198)

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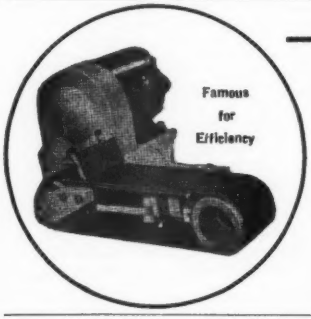

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. . . Safety Equipment, from page 192

ferent dies. I have frequently observed presses operating with the ram adjusting screw locks loose. This is a bad practice because there have been occasions where the ram adjustment moved down slightly as the press operated and caused broken dies and presses. Obviously, this is not good practice and some provision should be made to make certain that these ram adjustment screws are properly locked.

Stroke Indicator

Whenever the press crank is covered up, it is impossible to readily tell if the press is at the top, center, or somewhere else in the stroke. When operating or setting up a press it would be safer if the press had a stroke indicator so that the operator or the set-up man couldn't mistake the position of the press ram with the respect of the press stroke. It has happened on numerous occasions where a die or press has been wrecked because the operator or job setter thought the press was at top center when adjusting shut-height and when the press was tripped the wreck resulted.

All Openings Covered

Whenever there is any danger of fingers, hands, or arms being put in an opening where they would get pinched, jammed, or cut off, these openings should be enclosed and the guards always in place when operating the press. Even if there are no moving parts, it is highly desirable to enclose openings to prevent accumulation of trash, oil, and other combustible materials, and the opening should be adequately drained to prevent accumulation of liquids.

Tie Rod Nuts Chained On

There have been a number of accidents where tie rods have fractured and a section of the rod and the rod nut has fallen to the floor. A good remedy for this is to fasten the nut to the press by a chain or at least provide a means to contain it if it tears loose. We have experienced this particularly on the O.B.I. press with the two front tie rods and have used the chain method. In addition, if the rod does break, a section of the rod drops down and may land on an operators foot. We therefore welded a small piece of steel to the tie rod just above the press bed, so that if the tie rod starts to fall it will only drop a fraction of an inch.

Press Operator Controls That Assure All Operators are out of the Danger Zone

One of the most important features from the standpoint of operator safety is the use of operator controls to assure that all operators are out of the danger zone before the press is tripped. These can take various forms, but they should provide that, should any operator release his controls to reach into the press while the press is on the down stroke, that the press would immediately stop. In addition, one or more emergency stop buttons should be provided to stop the press at any part of the press stroke.

There are undoubtedly more points that should be added to this list, but I have tried to indicate the main points that I feel should be considered.

Above all remember that a press like any other piece of mechanical equipment is subject to failure and faulty operation and this fact should be kept in mind at all times. Modern presses are well built, well designed and safe, but to keep them that way requires care and maintenance which brings me to the next portion of my subject which is, "Keeping Equipment Safe".

Keeping equipment safe requires a constant effort on the part of the maintenance people. A continuous inspection will uncover troubles before they become serious enough to cause press failures. How often, how to do it, and what to look for will depend on how many presses you have, what kind they are and how much the press equipment is being used. In general, how often to do it would be about two to four times a year based on two shift, five-day operations. In some cases, on some operations, it might be advisable to check presses weekly and even daily if required. These cases would be rather rare. In our own plant which has about 600 presses of different types we usually average about three inspections a year.

Having determined the approximate rate at which the inspections are to be made, the next step is how to get it done. We first tried letting the repairmen check all the presses in the department by going

(Continued on page 200)

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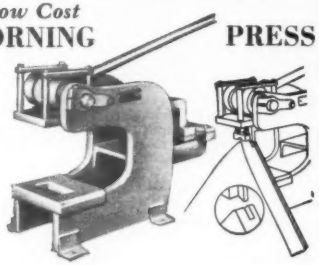

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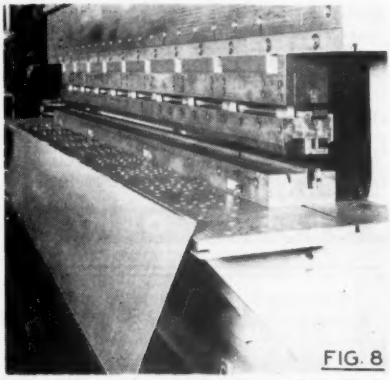

Fig. 8. Shows four station, double deck die for making triple-fold front form and back flange on the outer shell. Upper bolsters and front ram angles are removed to allow part to form up in the first operation.

jections, the second drawing and forming complete, using springs for pressure.

In a similar way, the right and left hand door opening reinforcements were made, the first operation piercing and forming tabs, punching holes and notching the sheared blank, the second operation drawing and forming complete.

The cabinet top reinforcements were blanked from a rectangular sheared blank in the first operation and drawn completely in the second.

Discussion of the outer shell has been left to the last, as it is the only part for which two die setups were required. The first operation was notching the blank which was approximately 22" x 141" in size. Several notching units were spaced as required along the length of a pair of bolsters or rails, and clamped with set screws as illustrated in Figure 7. Being individually adjustable, changes for different sizes and models were relatively simple. The lower bolster, which was of welded ribbed construction with sheet metal chutes to expel the notched scrap pieces to the rear of the bolster, was guided by removable guide post and bushing sets at the ends.

In operation, the sheared blank was placed on the front section of the die against gauge pins and one stroke made which notched the front edge and punched the hinge holes. The blank was then pushed through the die to the rear and the back edge gauged in the same way against gauge pins and notched in a different pattern by a second stroke. For greater production, both front and rear positions were filled for each stroke, thus completely notching and piercing one blank each stroke.

The forming operations were performed on a double deck die which is unusual in having forming operations on two levels on both front and rear sides of the die. (See Figures 8 and 9)

The first operation, in the front, lower level makes a partial form on the front triple-flange section. The second operation

(Continued on page 202)

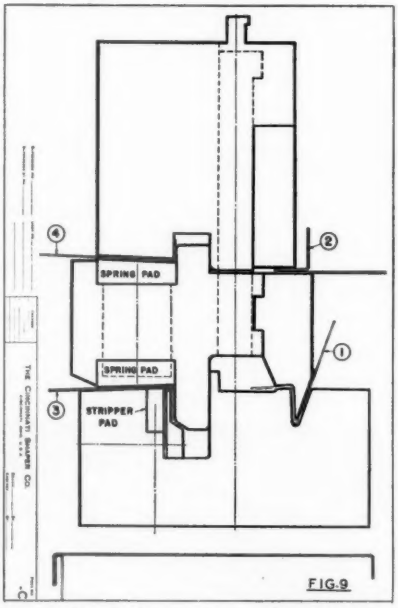

Fig. 9. Sketch showing four positions of double deck die for triple fold and back flange. In operation, only one front and one rear station is used at each stroke, completing a piece each second stroke. A cross section of the completed piece is shown at the bottom of the sketch.

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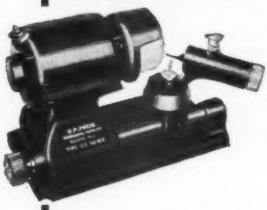

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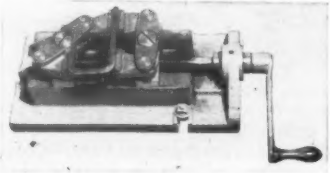

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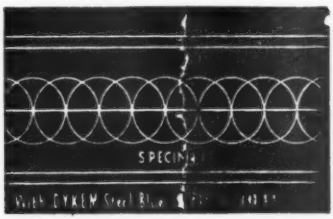

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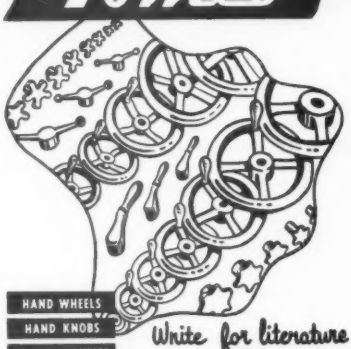

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from one press to the next. We soon found that some presses were being missed while others were being checked twice. In order to correct this we had check sheets made which gave the press name, number, and location. On this same sheet was room for indicating any troubles found and whether repaired. We found it desirable to make as many repairs as possible within a given time limit, and any repairs that could not be done were listed and put on the repair work schedule as soon as possible.

Now as to what to look for, we made up a procedure for checking presses which was distributed to our repairmen. This sheet read as follows:

Procedure for Punch Press Inspection

A. This procedure has been set up to enable our department to make minor repairs and adjustments and to prevent as far as possible the major press breakdowns. It also enables us to spot wear in machinery so that these repairs may be scheduled with the least amount of interruption to production.

B. In order to accomplish this result, we listed below some of the points to be checked. This list is by no means complete but will serve to indicate the things we expect you to check.

C. 1. Press Frame: (a) Check for cracked or broken parts. (b) Check for loose bolts. (c) Check all guards to be sure all bolts are in and tight.

2. Press Clutch and Brake: (a) Check adjustment of clutch and brake by operating press if possible. (b) Check for loose bolts and mounting brackets, broken springs. (c) Check solenoid valve for loose or broken bolts and broken springs.

3. Press Crankshaft: (a) Check main bearing cap bolts. (b) Check main bearings for excessive wear.

4. Press Drive: (a) Check for loose bolts on motormounting, motormounting brackets, bearing brackets, guards. (b) Check for broken or loose bolts. (c) Check gears for wear or broken teeth and cracks in gears. (d) Check for loose keys. (e) Check for worn bearings. Note: Remove gear guards to check keys and gears.

5. Press Ram: (a) Check gib adjustment and gib bolts. (b) Check ram adjustment mechanism. (c) Check connector screws. (d) Check connectors.

6. Press Controls: (a) Check for loose bolts, trip rods, solenoids, mounting brackets, foot pedals, air cylinder. (b) Check air cylinder and air valves for leaks. (c) Check tripping adjustment.

7. Press Counterbalance & Pressure Pad Cylinders: (a) Check for loose bolts. (b) Check for air leaks. (c) Check for worn gibs. (d) Check for broken springs.

8. Press Electrical Controls and Wiring: (a) Check and report any wiring or control boxes that need attention.

9. Press Air Controls and Piping: (a) Check and report any broken lines or air leaks. (b) Check air ejection mechanism to be sure it works and report any machine with continuous blow or no ejection mechanism.

D. You are expected to make repairs as you find they are necessary. Contact your foreman if in doubt as to whether to go ahead with the repair.

E. A dated report should be made out on each press showing troubles corrected and repairs still needed. The names of all men in each inspection group should be at the bottom of their report.

F. In case of any further question contact your foreman.

This is one method that is suggested to keep presses in good repair and therefore safe. There are undoubtedly other methods or systems that could be used. The guiding principle is to determine how often the safety inspections should be made and then set up a check sheet for definitely identifying the presses to be inspected. These check sheets with comments can form a parmanent inspection file.

While regular inspection will disclose repairs and unsafe conditions, another valuable source of this type of information is the press operator and his supervision. Constant operation of the press will enable the operator to immediately spot something wrong and in many cases we have averted major repairs and severe accidents by following up operators' reports of trouble.

To sum up, if safety is considered when purchasing any equipment or rebuilding old equipment and a regular schedule set up and followed then you will be on the road to having, "Safe Equipment and Keeping it Safe."

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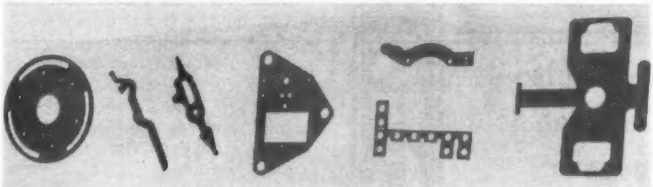

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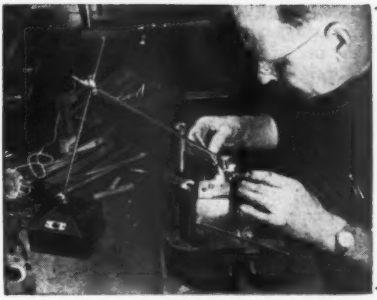

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Tool and Die Makers acclaim it for its utility, getting into nooks or crevices hard to get at with ordinary light—for lining up punches in dies, or working with the scriber in close places. Completely adjustable and portable. Light does not reflect back to your face. Ideal for Inspectors seeking burrs, flaws, etc. Price— complete with 2 size bulbs, $13.75

Write for Literature

Twentieth Century Mfg. Co.
3720 Montrose Ave., Chicago 18, Ill.

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

Cut accidents — Increase man hour production with a . . . . . .

SHOPLIFTER

Handles heavy dies from storage rack to press. Lifts barrels, boxes, loads trucks, makes a handy adjustable shop table. Automatic brake holds load at any height.

Type D — Hand operated
CAP. 500 lbs.....$183.60

Type DE — Electric operated
CAP. 500 lbs.....$412.08

Type DX — Hand operated
CAP. 1000 lbs.....$349.52

Type DX — Hand operated
CAP. 2000 lbs.....$417.52

Floor lock included.
Prices net F.O.B. Chicago

ECONOMY ENGINEERING COMPANY
4509 West Lake Street
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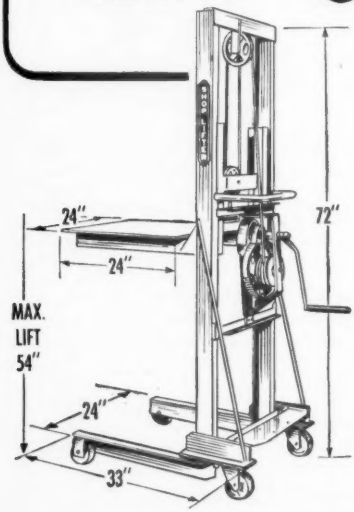

. . . Tooling Press Brake, from page 198

is one on the front, upper level and consists of flattening the fold. Since the fold must be flattened very completely in preparation for subsequent operations to be successful, considerable pressure is required. Indeed, this operation determines the tonnage capacity requirement of the press brake.

The third operation completes the triple-fold front edge on the lower level at the rear of the die, the piece first being pushed through the die from the front and turned over before being placed in position on the die. A mandrel strip arranged to have a small amount of movement and a spring stripper pad permit the work piece to be inserted and removed without difficulty.

The fourth operation is made by again turning the piece over and forming the rear flange in a wipe-up type of die at the rear upper level. Finished width is held within close limits by completing this simple form last, gauging from the completed triple flange.

In production, two stations of the die are used each stroke, thus completing a piece each second stroke of the press brake. A very desirable feature of this die is the ability to complete the forming in one handling, which makes it compare favorably with the rolling-machine process used in this country.

The final operation on the outer shell was performed on a tangent bending machine in the same manner which has become standard practice in this country.

Using the tooling setups described on one press brake, together with one squaring shear, one tangent bending machine, and one special bending fixture, between 5,000 and 10,000 refrigerator cabinets per year, or at least all the principal components except the door, can be produced. The parts produced will assemble interchangeably with parts made in conventional presses. This is of particular value for foreign manufacturers operating under license to produce standard U.S. models, where a portion of the parts may be imported for one reason or another.

The versatility and adaptability of the press brake for special tooling can be illustrated by many case histories, but I believe this "cold-storage" story is an exceptionally good example.

Specify DESTACO **Arbor Spacers and Shims**

For milling, slitting and gang-saw setups, shimming gears and bearings. Sets in 20 diameters ⅛" to 4". 19 graduated thicknesses .001" to .125", specials over .125". Spacers with keyways, shims without. Stocked by Industrial Distributors.

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DRILL, CLEAN, BRIGHT, ACCURATE HOLES IN

HARDENED STEELS

WITH A ROCKWELL HARDNESS OF C34 to C68
OUR FREE BOOKLET TELLS HOW

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ALL DRILLS SHIPPED FROM STOCK

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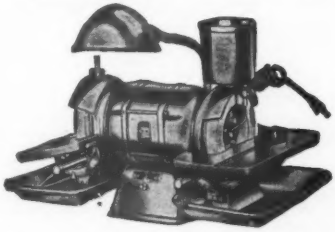
We also manufacture the NU-MIKRO piston grooving tool.

CHAMPION TOOL CO.
BOX 463 - FARMINGTON, MICHIGAN

Baldor

Carbide Tool Grinder



For precision work

Short wheel and bearing centers, heavy shaft, large ball-bearings, dynamically balanced armature and weight-balanced wheels provide rigidity and smoothness necessary for precision work. ½ hp, 3400 RPM reversible motor. $142.60 complete.

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SAVE ON PRODUCTION TOOLING COSTS with CARDINAL -SPEED VISE-

The exclusive, quick-acting clamping mechanism of SPEED VISE accommodates a wide variety of parts.

A **HUNDRED** JIGS IN **ONE**

Drill jigs are simpler, smaller and cheaper when made for use in a SPEED VISE.

SEND FOR NEW LITERATURE
-SPEED VISE- Stocked by leading Distributors

CARDINAL MACHINE COMPANY
GLENDALE, CALIF.

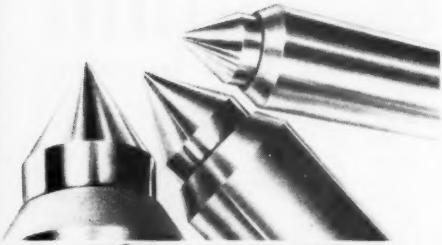
SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS

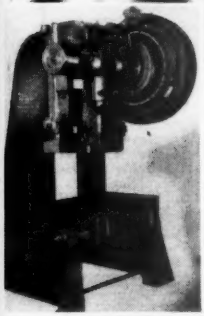
An Electrode Holder that is lighter, cooler in operation, and more efficient than previous types, has been developed by Erico Products Inc. Called the Caddy Type B 500 AMP, it is fully insulated, and has a replaceable copper jaw welded direct to the power cable. Flexing at the weld is eliminated, together with the need for insulating the connection. ERICO PRODUCTS INC., 2070 E. 61st Place, Cleveland, Ohio.

Circle Inform-A-Gram No. A1.



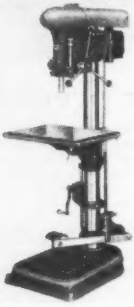
An Alloy Developed to withstand pressure and heat generated in jet engines is being used to make dead centers for lathes and grinders. Centers made from this alloy may be run for weeks on jobs normally requiring fresh H.S. steel centers each day. Available in all sizes of Morse, Brown & Sharpe and Jarno tapers. For details of the Super-Center, write the Do-ALL CO., Des Plaines, Illinois.

Circle Inform-A-Gram No. A2.



A New Press-Rite Open Back Inclinable Power Press of 60 ton capacity has been developed by the Sales Service Machine Tool Co. The model 60 has improvements in design which include a larger die space with no sacrifice in weight; clutch gripping pressure that can be set for every operation and tons required and which cannot be engaged at the same time as the brake; and high-tensile steel tie rods in the frame that reinforce the gap of the press. Bolster area 21" x 32", depth of throat 11". SALES SERVICE MACHINE TOOL CO., 2363 University Ave., St. Paul 4, Minnesota.

Circle Inform-A-Gram No. A3.



An Improved 18" Drill Press has just been announced by the Duro Metal Products Co. Some features are precision ground spindle, bearing seats bored to provide perfect alignment, and adjustable feed tensioning. The press is available with a production type base, or with or without foot feed. Capacity ¾" in cast iron, speed range 450-1965 r.p.m., spindle travel 5". Write to Duro Metal Products Co., 2681 N. Kildare Ave., Chicago 39, Ill.

Circle Inform-A-Gram No. A4.

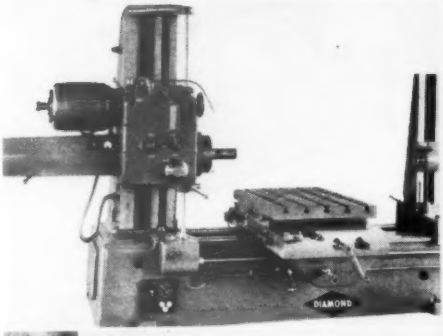
Two-Dimension Positioning of the work is the feature of a new hydraulic straightening press from E. W. Bliss. The press bed can be moved from side to side, and the plunger assembly from front to back, both at the touch of a lever. A number of blows may be struck on the same piece without changing the setting of the press table. A special control system permits rapid approach of the slide to the work, a slow operation speed, and speedy return to the up position. Address the E. W. BLISS CO., 1375 Raff Rd., Canton, Ohio.

Circle Inform-A-Gram No. A5.

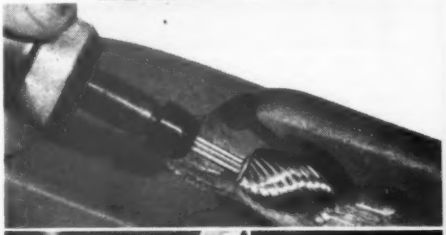
ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

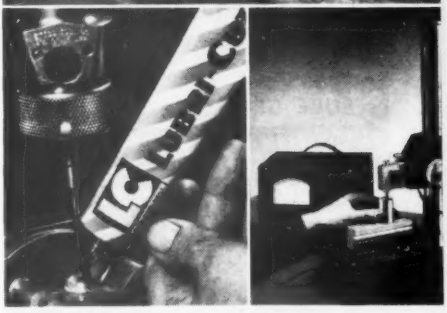
A New 3" Horizontal Boring Mill has been announced by the Diamond Machine Tool Company. The mill has 18 feeds with rapid traverse in all directions, infinite control of feeds on facing head, and a 10HP motor with amperage load regulator. Diameter of the spindle is 3", and its maximum run 32¼". For complete information write for a catalog sheet on the Diamond AL72 to Diamond Machine Tool Co., 3429 E. Olympic Blvd., Los Angeles 23, Calif.
Circle Inform-A-Gram No. A6.



A New Rotary Tool with highly polished flutes is the result of on-the-job research carried through by M. A. Ford engineers. This high polish reduces flute loading, and promotes improved chip flow. The tool also has a special flute rake angle. It is especially valuable in magnesium and aluminum applications, outperforming and having a longer life than conventional rotary tools. Bulletin from M. A. Ford Co., Inc., 817 W. River Street, Davenport, Ia.
Circle Inform-A-Gram No. A7.

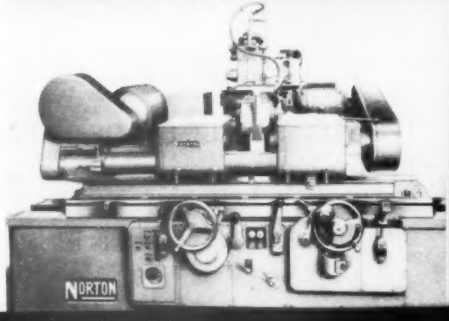


Tap Life May Be Increased as much as sixteen times by using Lubri-Cut, a new tap and drill lubricant made by the Tap and Drill E-Z Corp. Lubri-Cut is effective for most operations on ferrous and non-ferrous metals, including tough alloy steels and titanium, and may also be used with plastics and glass. Samples available from Tap and Drill E-Z Corp., El Segundo, Calif.
Circle Inform-A-Gram No. A8.

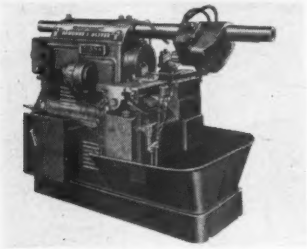


A New Electronic Production Gage has been announced by the Graham-Mintel Instrument Co. Designed for repetitive dimensional gaging on long or short run or tool room work, the gage gives readings in definite fractions of an inch. Two alternative linear scales read plus and minus .005" and .0005", or .002" and .0002" respectively, with 10X amplification at will. Work capacity 8⅜" above anvil top. One amplifier can be arranged to serve several of the induction type gage heads. Bulletin 103, Graham-Mintel Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Circle Inform-A-Gram No. A9.

Production Grinding of the External Airfoil Surface of jet engine turbine blades is possible with the new Norton compound contour blade grinder. Cams in left and right hand shape-producing units impart a figure 8 motion to the arbor on which the blades are held. Arbors are designed to suit the specific conditions of the blade, and to support it at the correct angle. The machine is equipped with automatic grinding cycle for consistent productivity. Norton Co., Worcester 6, Mass.
Circle Inform-A-Gram No. A10.



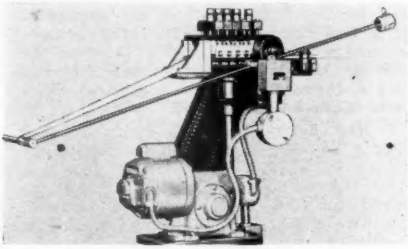
Two New Models have been added to the Bardons and Oliver range of cutoff lathes. The No. 33 has a capacity to 3" diameter (2½" pipe), and the No. 34 a 4" (3½" pipe) capacity.



Electric remote control permits automatic cutoff to any length. Spindle speeds range from 85 to 1100 RPM with four quick changes. A pair of reversible pick-off gears makes available a total of eight speed changes. Independent hydraulic systems are used for the cutoff slides and collet chuck operations.' As no cams are used, complete set-up changes can be made in less than one half hour. Bardons & Oliver Inc., 1146 W. 9th Street, Cleveland 13, Ohio.

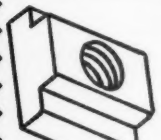
Circle Inform-A-Gram No. A11.

A Motor Drive For Stock Straighteners has recently been introduced by the Durant Tool Supply Company. This new drive eliminates possible strain on the roll feed or on the press operator, and it also ensures that exactly the right amount of material is passed through the straightener as it is needed. The drive is available for any of the standard range sizes of Durant Stock Straighteners, and can be used in conjunction with Durant Reels and coil cradles to better production and increase efficiency. For further information and a complete



descriptive catalog write to the Durant Tool Supply Company, 155 Orange Street, Providence 3, Rhode Island.

Circle Inform-A-Gram No. A12.



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Stud Sets
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Strap Clamps
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SURE GRIP STEP BLOCKS
TIETZMANN TOOL CORP.
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has been done with the
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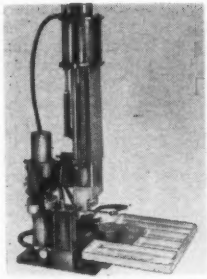
PRECISION VERNIER CALIPERS

The TUNA Precision Vernier Calipers are made of best Swedish steel with hardened measuring surfaces.

Measuring length	5⅝"
Graduated in	.001"
Depth of jaw (external)	1⅝"
Depth of jaw (internal)	⅝"
Depth of measurement from	0 to 5⅛"
Net weight	5 ounces

HIGH QUALITY • LOW PRICE, $9.75 • IMMEDIATE DELIVERY
Leatherette Case for Calipers, $1.00

SWEDISH GAGE CO. OF AMERICA
C. E. JOHANSSON GAGE CO.—A DIVISION
8900 Alpine Avenue
Detroit 4, Michigan



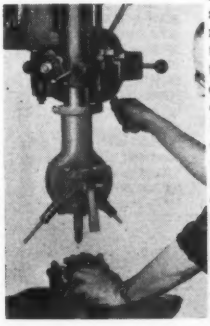
A Fifty Percent Increase In Operating Speed is the result of new design features incorporated in the Model RR-6B staking press by Winter. The new press is capable of 100 or more strokes per minute, maximum rate limited only by the nature of the work and the skill of the operator. A quick-exhaust valve is built in, with an ejection system to remove work automatically from the lower die. Like earlier models it is a bench-mounted unit for light staking, forming, and other secondary-press work where speed and precision and low fatigue are important. It is capable of delivering an accurately controlled impact from 0 to 12,000 pounds, or a squeeze up to twelve times air line pressure. Stroke may be set for one or two inches. Winter Products Inc., Box 2112 Barnum Station, Bridgeport, Conn.

Circle Inform-A-Gram No. A13.

A New Small Cam Valve has been announced by Ross Operating Valve Co., 120 East Golden Gate, Detroit 3, Mich. Excluding the cam roller, the new unit is less than 4" high and has a 3" by 3½" base. It is a ¼" four-way valve with a long lever. Lever travel is less than 1". The new model is known as Ross Valve No. 636.

Circle Inform-A-Gram No. A14.

Sequence Drilling, Countersinking And Tapping on a single drill press spindle are made possible by a three spindle turret head made by Commander Mfg. Co. that can be attached to any drill press. The new tool provides a selection of speeds on each spindle for drilling, reaming, counterboring and tapping at recommended speeds. Capacity on all spindles is ⅜". Adjustable torque control spindles for the protection of taps up to ¼" may be supplied for any or all spindles. Positive indexing of the turret is accomplished without stopping the drill press motor. The selected tool rotates only after the spindle is indexed and automatically locked. Lower costs and better production and accuracy are obtainable as the device permits sequence operations at the proper speeds without removing the work. Commander Mfg. Co., 4225 W. Kinzie Street, Chicago 24, Illinois.



Circle No. A15.

LAYOUT FLUID
FOR ANY METAL

WRITE FOR FREE SAMPLE

Scribed lines are easy to see against the dark blue background. Speeds up layout work and cuts costs. Merely wipe surface clean and brush on layout fluid. *Dries instantly.* Write on your company letterhead for free sample. Advise us if your local supply house doesn't carry.

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Manufacturing Company

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DEPT. B, P. O. BOX 762
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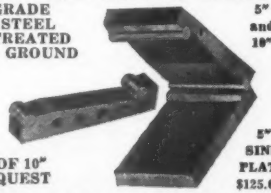
SINE PLATES and BARS
HIGH GRADE
ALLOY STEEL
HEAT TREATED
FINISH GROUND



5" and 10"
5" SINE BAR $35.00
PRICE OF 10" ON REQUEST
5" SINE PLATE $125.00

BRAND TOOL & SUPPLY CO.
907 S. VICTORY BLVD. BURBANK, CAL.

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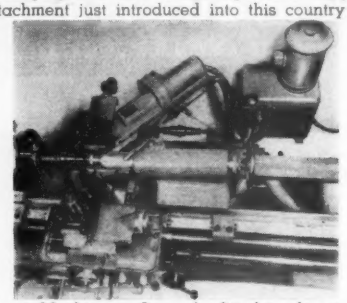
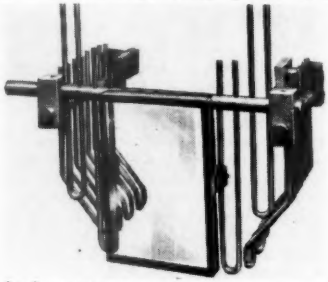
Almost Any Lathe Can Be Converted Into An Automatic Tracer Controlled Machine with the "Bondycop", a new Swiss hydraulic copying attachment just introduced into this country by



Morey Machinery. It can be fitted to almost any lathe, and uses either the first piece of the batch or a jig as a pattern. The chance of error is reduced to a minimum since the operator controls only one measurement. The Bondycop will copy angles of 90° in the direction of the headstock. The standard unit can be used for all diameters up to 6" and can also be supplied in sizes 40" to 80" between centre points. It can also be used for milling. Morey Machinery Co., Inc., 410 Broome Street, New York 13. **Circle Inform-A-Gram No. A16.**

Greater Work Visibility, Improved Flexibility of Adjustment are the features of a new punch press safety guard from W. I. Martin. A transparent window of laminated safety glass secures complete protection and clear vision of the entire die area. Fogging and scratching commonly experienced with plastic windows is eliminated. Individually adjustable steel rods can be raised or tilted to fit the exact contour of different dies or types of work. Illustration shows Type L Offset Side Gates for getting closer to dies on strip-feeding operations, other



standard variations in construction are provided to fit diversified requirements. Write W. I. Martin & Co., 224 S. Michigan Ave., Chicago 4. **Circle Inform-A-Gram No. A17.**

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Solid Carbide Drills
HERE AT LAST!
SOLID CARBIDE DRILLS, developed by RAYMAC . . . cut, do not burn thru hardened metals at slower speeds . . . give cleaner and more accurate holes . . . less drill breakage and longer drill point life.
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PUNCHING and FORMING DIES
for All Sizes and Makes of
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Northwestern
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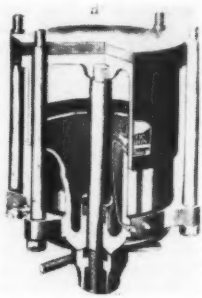
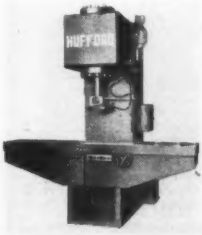


Greater Strength With Minimum Weight is obtained with the new design of die cushion from Dayton Rogers. All critical stressed sections are reinforced. A fully hardened and ground pin pressure pad, to fit the press bed opening, assures accurate alignment of the parts. These semi-steel die cushions have uniform grain structure and high tensile strength. The design has also been modified so that the units can be fastened directly to the bolster plate or provided with a mountig plate whereby they can be installed on the press bed. This allows the bolster plate to be removed without disturbing the cushion installation. The unit comes ready to install with a combination reducing regulating valve and pressure gage. Write for descriptive literature to the Dayton Rogers Mfg. Co., Minneapolis 7, Minnesota.
Circle Inform-A-Gram No. A18.

A Series of Adjustable Hole Laps is featured in a new brochure from the Brickner-Kropf Machine Co., Muskegon Heights, Michigan. Two size ranges are described, covering ¼" to 2-9/16" by increments of 1/32". The brochure also covers lap shoes and honing stones, and a section on the care and use of lap tools.
Circle Inform-A-Gram No. A19.

Automatic Stroke Limiter Prevents Overbending in the new Hufford straightening press designed for sensitive work. A vertical shipper rod attached to the side of the frame is linked to a hand lever manually controlling the press. In shifting this rod up or down, fluid volume from the variable volume pump is increased or decreased in proportion to lever displacement. A stop, attached to the shipper rod, is engaged by the ram in its descent, gradually bringing hydraulic volume to zero and halting the ram automatically in any predetermined position. Micrometer settings are made by means of a handwheel, one revolution of which equals .125 of ram travel. An automatic counter indicates ram extension to within .101" from the starting position, and a dial gage shows applied force from 0 to 150 tons. Hufford Machine Works Inc., 100 E. Grand Ave., El Segundo, California.
Circle No. A20.



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Use ACE Drill Bushings once—and you'll agree they're tops in every way. Made of highest grade tool and alloy steels for extreme durability and longer life. Correctly engineered. Maximum accuracy guaranteed by triple inspection plus light wave control. Order your copy of our FREE catalog today.

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Sieve and Micron Sizes
Closely graded and Purified
Complete Powder Reclaiming Services for
Sludges, Used wheels, Lapping Cotton
Write for Prospectus
C. W. DANFORTH CO.
(Established 1912)
Box 448, Youngstown, Ohio

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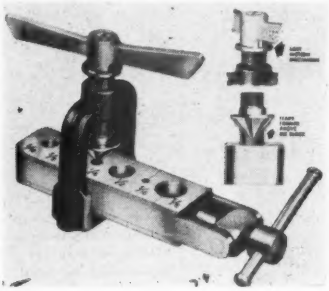
MFGR'S OF
ROTARY FILES
COUNTERSINKS
HIGH SPEED CUTTERS
TUBE BURRING FILES
BEAVER
ROTARY FILE COMPANY
119 E. 23rd St., Los Angeles 15, Cal.

SEE ADVERTISERS INDEX, PAGE 185, FOR KEY NUMBERS

Automatic Burnishing Of Flare Faces as they are formed is the feature of a new tool for flaring soft copper, steel, aluminum and brass tubing. The tool will make 45° flares on standard size tubing from 3/16" to ⅝" O.D. The



automatic burnishing action is provided through the use of a lost motion mechanism in the yoke which disengages the feed during the first revolution when backing off the cone. The flare is formed in the air to assure retention of original wall thickness. Imperial Brass Mfg. Co., 1200 W. Harrison Street, Chicago 7, Ill.

Circle Inform-A-Gram No. A21.

Instant Reverse Is Possible With The New Zero-Max variable speed torque converter. The unit is known as the Model 142XR, and has variable speed from 0 to ¼ input speed in either direction. The speed and reverse controls are separate levers and the transmission can be reversed at any time, with or without load on the output shaft. The reverse lever moves through neutral, and in this position the output shaft is free and can be manually rotated in either direction. Speed and direction control levers operate in the same plane. The model 142XR is rated at ¼ HP at 350 rpm. with 1725 rpm. motor input speed. The load rating is twenty inch pounds. The output speed is infinitely variable from 0 to maximum ¼ input speed in either direction. Excluding shafts the dimensions are 6" x 3½" x 5¼" and the unit weighs 6 pounds. Typical uses are for turntables, conveyors, feeders and all kinds of industrial and other equipment where change of both direction and speed are required. Several other Zero-Max models are available. Write Revco Incorporated, Dept. 2E, Franklin Avenue, Minneapolis 4.

Circle No. A22.

SAVE
TIME and MONEY
with
GARBERDING

STOP-PINS
AVAILABLE IN 3 SIZES

FINGER STOPS
IN 3 SIZES

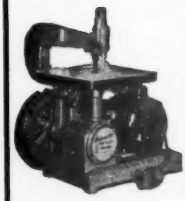
STOP-PINS are complete self contained units that hold securely in stripper plate. All sizes have 1/32" wall permitting insertion close to die or punch. No threads inside STOPS for springs to catch on. Write for literature and prices. GARBERDING FINGER STOPS made in uniform width to fit any standard width slots. Just grind ends to fit.

Write for literature.

TWENTIETH CENTURY MANUFACTURING CO.
3720 MONTROSE AVENUE CHICAGO 18, ILLINOIS

MILWAUKEE DIE FILERS PROFILE GRINDERS

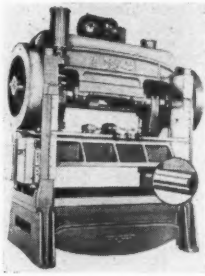
Gives you more value for your money!



DIE FILER
Model FS shown performs all die making operations. Equipment includes File Roller Support Overarm in addition to overarm shown.

PROFILE GRINDER
Available in two models, STANDARD and HIGH SPEED. Features ½ HP Motor for non-stalling power, Collet Chuck for extreme accuracy and compound tilting table.

RICE PUMP & MACHINE COMPANY
228 N. MILWAUKEE ST., GRAFTON, WISCONSIN



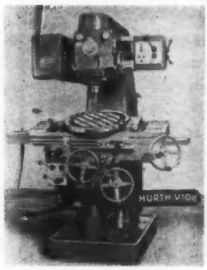
Illuminated Beds To Eliminate Die Breakage are the feature of a new line of Thunder Bay presses. Offered in a complete range from 125 to 400 tons, presses are fitted with a fluorescent tube placed at each end of the bed, which ensures full all-round visibility at all times. Thunder Bay presses also offer additional features which include bed drilled for easy die cushion installation, a ram length equal to gib length, and large gaps in columns for feeding of coil stock from the sides. Standard equipment are Ampco bronze bearings and bushings, crankshaft of 6145 S.A.E. heat-treated steel, and a Borg Warner friction clutch. A multiple adjustable cam limit switch provides for clockwise or counterclockwise rotation. Write Thunder Bay Mfg. Corp., 227 Iron Street, Detroit 7, Michigan.

Circle Inform-A-Gram No. A23.

A Newly Developed Deburring and Barrel Finishing Compound is now available from the Blue Magic laboratories. Called S-12, this compound reduces deburring time by 75 to 90%, and produces uniform radii on parts such as bearing races and retainers. The compound is also a good temporary rust inhibitor. The manufacturer offers lab. facilities and test runs. Write Blue Magic Chemical Specialties Co., 2135 Margaret St., Philadelphia 24, Pa.

Circle Inform-A-Gram No. A24.

Vertical Milling, Downfeed Milling And Jig Boring can now be done on a single machine and with a single set-up of the work in the German made Hurth V10a Boring and Milling Machine. Longitudinal traverse of the work-table which can be tilted 15° in two directions, is used for vertical milling, longitudinal traverse of work-table and graduated downfeed of cutter spindle for downfeed milling. Spindle downfeed can be varied in extremely small steps for jig boring. While the machine is designed for precision machining of jigs, fixtures and other tools, it is equally well adaptable to long run production work. 13 spindle speeds cover the range from 45 to 2,800 rpm. 9 boring speeds are available for each of the spindle speeds. Literature and specifications from Kurt Orban Co., 205 E. 42nd Street, N. Y. 17, N. Y.



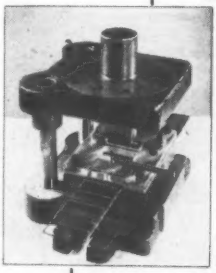
Circle No. A25.

Fast, Accurate Measurements
With the AMIC "Quick-Action"
Vernier Caliper

AT NEW LOW PRICES
The perfect tool for machine shop, tool room inspection and Quality Control. A flick of the thumb and you've got your external and internal dimensions. Knife-edged hardened jaws provide exact thread measurements. A depth gage blade gives speedy measurements. AMIC designed and made exclusively for AMIC by an outstanding European manufacturer.
Scientifically engineered, painstakingly machined, packed in a sturdy leatherette case. A tool without rival.
Size 6" #21B, Graduation 1/40", vernier reading .001.
#22B, Graduation 1/40" and full MM, vernier reading .001 and 1/10 MM.
Write for Circular A. Dealers inquiries invited.

AMERICAN MEASURING INSTRUMENTS CORP.
AMIC BUILDING
21-25 44th Ave., Long Island City, N. Y.
TELEPHONE: EXeter 2-0002

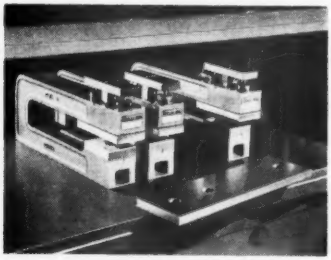
NEW!
HEAVY SIZE WEST AUTOMATIC DIE STOP



West's Automatic Die Stop is now available in a large size. This Stop works with the same positive action as the old light model which has been in use over 10 years. It features a one-piece arm, built-in coil springs, and hardened steel throughout. Write for descriptive folder and template.

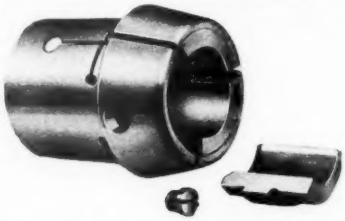
R. C. West Tool & Die Corporation
DEPEW, NEW YORK

New Wales Type "HS" Hydra-Strip Hole Punching Units for piercing holes in mild steel up to ¾" thick have been announced by Wales-Strippit. The heart of these new, extra-heavy-duty units is the Hydra Spring, which provides many times more stripping pressure than mechanical springs of the same volume by utilizing the compressibility of special fluids.



The Units are independent and self-contained, all components are built in, and punches and dies are kept in perfect alignment for life. Seting-up is a quick, simple operation; units are ready to start punching without adjustment on the first stroke of the press ram. For complete information write Wales-Strippit Corp., 345 Payne Ave., N. Tonawanda, N. Y.
Circle Inform-A-Gram No. A26.

Hall Manufacturing Co. have produced a new collet pad. Called the Universal No. 3, the pads are designed for use with the Hall Model B 2" collet chuck, and fit any standard make master collets made for the No. 3 collet pad. The parts are hardened and ground, with a special black oxide finish to prevent rusting. Hall Universal No. 3 pads are available for immediate delivery in round sizes ranging from 3/16" to 1½" in 1/32" increments. Hexagons from 3/16" to 1" by 16ths and squares from 3/16" to ½" by 16ths. Further information on



the range of Hall chucking products may be had on application to Hall Mfg. Co., 622 Tularosa Drive, Los Angeles 26, California. The simplified construction of Hall Chucks makes them easy, fast, and safe to operate. It also permits the operator to reset the work without the necessity of stopping the lathe.
Circle Inform-A-Gram No. A27.

STOP
OILY FLOOR MISHAPS

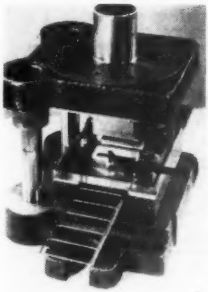
with Tamms
DRY-IT
Natural or Calcined Fuller's Earth 10-44 Mesh
Write Dept. 3 for FREE sample
TAMMS INDUSTRIES, Inc.
228 N. La Salle St., Chicago 1, Ill.

New NESTING TYPE
TOTE PANS
20" Long x 12" Wide x 6¼" Deep
16 Ga., drag holes, handles both ends.
J. L. LUCAS & SON, INC.
BRIDGEPORT 5, CONN.

EISLER JIG BORING
CAM MILLING
A SPECIALIZED ROWBOTTOM CAM MILLING SERVICE... JIG BORING... SPOT WELDING... CONTRACT PRODUCTION ...EXPERIMENTAL DEVELOPMENT

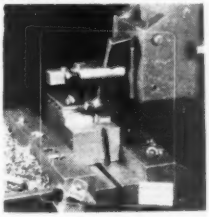
EISLER ENGINEERING CO., INC.
732 S. 13th Street (Avon Ave.)
Newark, N. J.

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION



Valuable Man Hours Plus Invaluable Minutes are saved and production speeded up by use of West's Automatic Die Stop. As the stock is fed into the die, a built-in spring forces a hardened pin into the perforation of the previous blank. This causes the die to stop on the correct position under the punch. As the punch descends, an attached set-screw forces the pin out of the perforation, another forces it over the top of the stock until it snaps into the punch perforation. This action positively stops and gages the stock for the next down stroke of the punch. This cycle of operation is repeated automatically, taking the guess work out of the press operations, speeding up production and saving material. Construction of the device is hardened steel throughout. R. C. West Tool & Die Corp., 110 Calumet Street, Depew, New York.

Circle Inform-A-Gram No. A28.



The Dilley Magnetic Grip-Shield is a recent development in shop protection. The Grip-Shield has a permanent magnet for attachment to the most suitable part of the machine, and its tru-vision safety shield ensures complete protection from chips without the inconvenience that is experienced in the use of goggles or other shields designed to be worn. It can be applied to any chip-producing machine, and positioned speedily in the most effective area for maximum safety and maximum vision. Illustration shows use on a shaper. Dilley Mfg. Corp., 1656 Ansel Rd., Cleveland 6.

Circle Inform-A-Gram No. A29.

A Utilities Rack On Wheels designed for handling small parts in the course of assembly or production is produced by Palmer-Shile. All steel, welded construction, with two swivel and two rigid casters. Standard dimensions: 24" wide, 50" high, 48" long overall, 12" clearance between shelves. Palmer-Shile Co., Detroit 27, Michigan.

Circle No. A30.

ONE Tool

ONE Set Up

...for boring, facing, turning recessing, undercutting

MASTERHEAD

THE BORING HEAD THAT THINKS FOR ITSELF

Featuring: **automatic feeds, end release and return; adjustable stop; adaptable to all standard machines; highest precision; ideal for jig borers; seven models for work up to 24" diameter.**

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$14.75 PPD

NEW EXCLUSIVE GAMLOCK AND GIB IMPROVEMENT INSTANTLY FIXES SETTING, PREVENTS SHIFTING, GUARANTEES SQUARENESS OF JAWS.

THE MAUSER TRADEMARK.. IS YOUR PROTECTION.

MONEY BACK GUARANTEE

FOR MEASURING INSIDE, OUTSIDE, AND DEPTH.

3 GRADUATIONS 1/1000" — 1/128" 1/10 m.m. IN BACK

GEO. SCHERR CO. INC. 200-1 LAFAYETTE ST.-N.Y.12, N.Y.

CONVERT YOUR ENGINE LATHES to TURRET LATHES

5-Tool Tail Stock Turret

Four sizes up to 24" swing

TODAY Send for Folder

JEFFERSON MCH. TOOL CO. 672 W. 4th Cincinnati 2, O.

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Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings.

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AMERICAN MEASURING INSTRUMENTS CORP.
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PRECISION DIES, JIGS & FIXTURES
Quality Stampings
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3338 Payne Ave., Cleveland, O., HEnderson 1-8644. External Cylindrical Lapping Machines, Special Machinery, Tools, Dies, Jigs, Fixtures.

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DESIGNERS and BUILDERS
Jigs, Fixtures, Dies, Special Machines and Parts
Short Run Production

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MOLD, DIE CUTTING. Die Design free lance. Box 1092, Hollywood 28, California.

PLASTICS MOLDS—by Gordon B. Thayer tells how to estimate, design, build and use plastics molds. There are 22 chapters (272 pages) of plastics tooling and production "know-how." More than 200 illustrations, tables and charts. $3.49 per copy. Address Huebner Publications, 1978 Lee Road, Cleveland 18, Ohio.

Sales—Service Representative

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Requires man for New England Territory. Please give past history and salary requirements. Local interview will be arranged. Reply Box 1020, Tooling and Production, 1975 Lee Road, Cleveland 18, Ohio.

Specify DESTACO SHIM STOCK

Made from selected steel or brass, rolled to precision limits, oiled to resist stain and rust, free from burrs. Twelve assorted thicknesses .001" to .015", sheets 6" x 12"; coils 120", identified every 6" by thickness and amount remaining on roll.

DESTACO DETROIT STAMPING COMPANY

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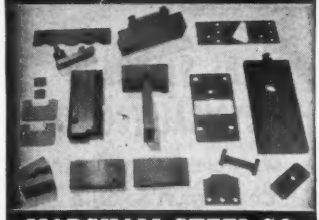
starting from scratch

WITH MARSHALL PRECISION GROUND FLAT STOCK



The world's largest range of sizes of precision ground tool steel in three grades are available, ready for immediate shipment and the layout bench.

★ **WATERcrat:** A fine grained electric furnace high carbon tool steel. It has been wet ground to remove all bad surfaces and to assure velvet finish of virgin metal.

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Write for descriptive literature, catalog of sizes and prices.

MARSHALL STEEL CO.

LA GRANGE, ILLINOIS

The Aristocrats of Ground Tool Steel

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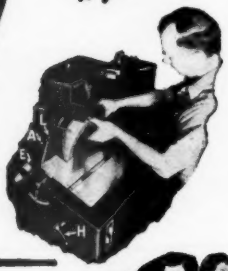
10" or 14"
TWIN WHEEL
WET OR DRY
TOOL GRINDER
FOR CARBIDE, STELLITE OR HIGH SPEED STEEL TOOLS

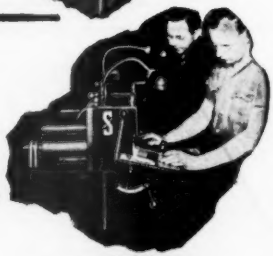
one step from rough to finish grind

PATENT PENDING
Type 10 TD



(Right) Mounting a new wheel in 5 minutes!

(Right) Operating view of 10 TD shows ample room to comfortably serve two operators. (Twin lights are optional.) Complete operator comfort when grinding wet. Absolutely no spray or splash.



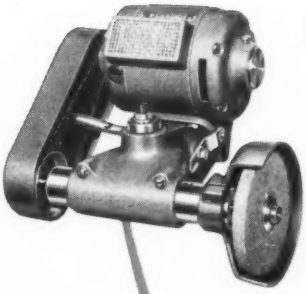
UNIVERSAL PRECISION PROTRACTOR — TOOL GUIDE with DRESSER grind any size tool for any desired angle.

WRITE FOR BULLETIN TW

THE STANDARD ELECTRICAL TOOL CO.
MT. HOPE & SIXTH STS.
CINCINNATI 4, OHIO

ALSO:
GRINDERS—ALL KINDS! UP TO 100 H.P. - BUFFERS—POLISHERS UP TO 60 H.P.
ABRASIVE BELT MACHINERY - SPECIAL MACHINERY - TWIN WHEEL TOOL GRINDERS

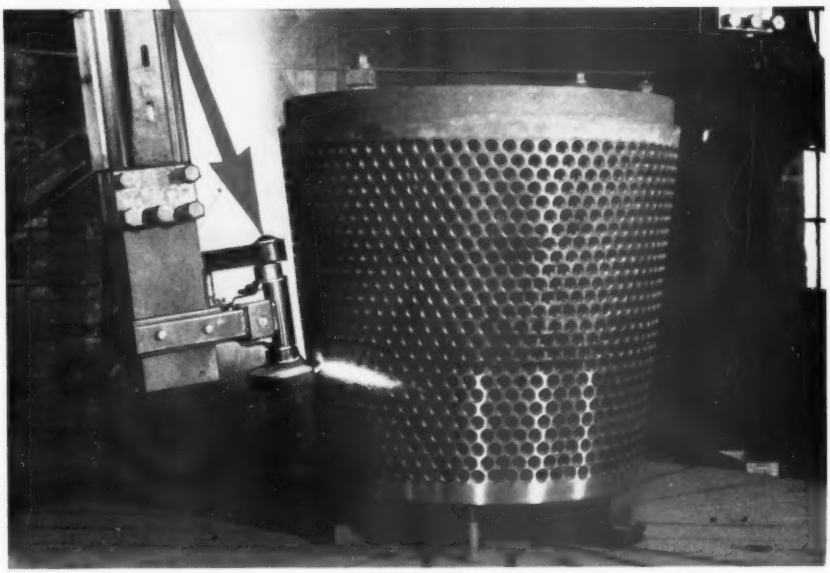
See us at Booth 18, Aisle D, Industrial Finishing Exposition, International Amphitheatre, Chicago, Ill., June 16 through June 20.



DUMORE® tool post grinders

add productive capacity

to your present machine tools



A Dumore Tool Post Grinder provided the only practical solution for this unusual problem. Mounted on a vertical boring mill, it halved production time for grinding the perforated, tapered surface of 43" cast iron strainer cores.

MOUNT this Dumore grinder on *any* machine and you'll get a more versatile tool. One that will not only machine the workpiece, but finish grind without changing setup. What's more, it delivers precision work to .0001" accuracy.

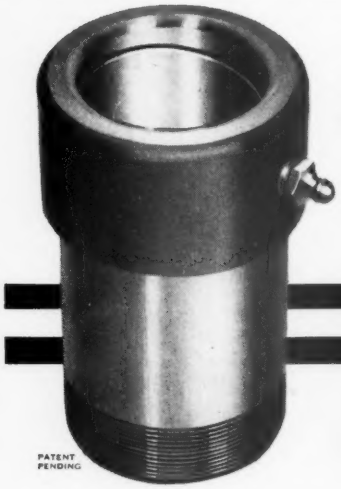
Production men say the Dumore grinder is the busiest tool in the shop. They like the high-quality work it turns out. It's ideal, too, for tool room and maintenance use.

Dumore Tool Post Grinders offer a broad potential for reducing labor and handling costs . . . increasing machine capacity.

Ask your industrial distributor for a demonstration, or write

THE DUMORE COMPANY

1313 Seventeenth Street • Racine, Wisconsin



BRONZE PLATED
ON HARDENED STEEL

LAMINA GUIDE PIN BUSHINGS

Cut operating costs 3 ways

1 Cost less

Each Lamina bushing will outwear several ordinary bushings. Long after ordinary steel bushings have scored or seized on the pin—long after bronze bushings have worn out of round . . . Lamina bushings have millions of strokes of precision service left in them. That's because Lamina bushings *are hardened steel with bronze electro-plated on the inside diameter.* They also have an oil groove in the inside diameter which is fed by a standard grease fitting on the collar.

2 Increased die life

Because Lamina Guide Pin Bushings wear longer and truer, they keep die shoes in perfect alignment. Further, their precision, free-sliding operation provides uniform stamping conditions on every stroke of the press. These two factors add up to definite increases in die life.

3 Press down-time reduced

Because Lamina Guide Pin Bushings outwear ordinary bushings many times, down-time for bushing replacement is less frequent, production time is increased. In addition, because they're seize-free and score-free, when replacement is required, it takes less time—lowers replacement costs.

FREE BULLETIN

These bushings are stocked in a wide variety of sizes for straight, shoulder and removable pins. Send for prices and bulletin which contains full information on these and other Lamina tools, dies and job-proven die making equipment.

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4270

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